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Paper TRADE JOURNAL

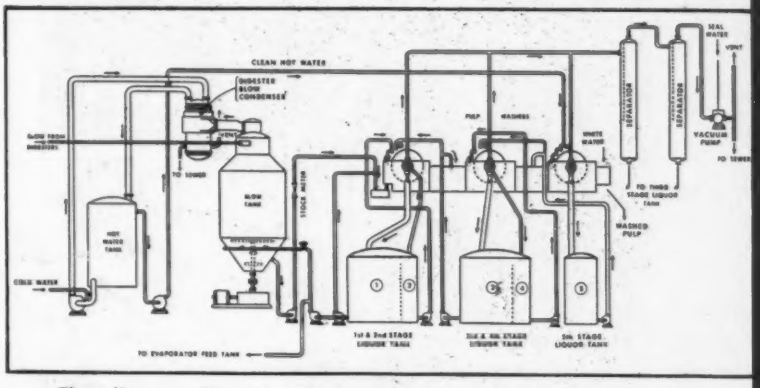
REG. U. S. PAT. OFF.

VOLUME 125, No. 22 NOVEMBER 27, 1947

Dilution is Reduced

by the multi-stage multiple-unit method of

SWENSON-NYMAN PULP WASHING



Flow diagram of Swenson-Nyman 3-drum, 5-stage pulp-washing system.

Today, pulp mill operators think in terms of four-, five-, and six-stage washing—employing Swenson-Nyman drums in series. Each drum washes in two stages, with a repulper between drums. Each stage employs as wash water the liquor drained from the succeeding stage . . . with fresh, clean water used only for the final stage.

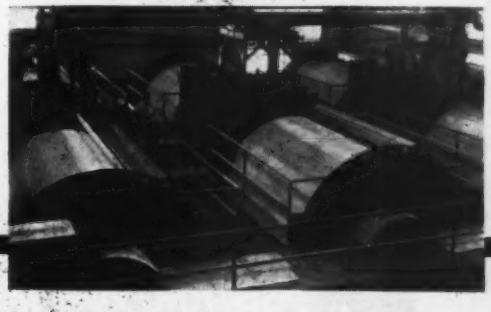
Dilution is a direct indication of washer room efficiency that reflects in evaporator loads, and fuel and steam costs. Hence, the favorable performance of recent installations of Swenson-Nyman Pulp Washers is attracting industry-wide attention.

Results from such multi-stage multiple-drum operation have shown cleaner pulp, less dilution, reduced chemical loss, and almost total absence of foaming difficulties.

The Swenson-Nyman process operates as a closed system—eliminating waste of valuable chemicals to the sewer, and avoiding problems of steam pollution.

Swenson's leadership in supplying improved equipment for pulp mill processes is amply demonstrated by the successful results of the Swenson-Nyman Pulp Washer. Swenson Engineers will gladly help you with an analysis of your operations, and recommend the installation best calculated to bring your mill up-to-date.

Write or phone for preliminary consultation.



Six Swenson-Nyman Pulp Washers arranged in two 3-drum lines. Each line provides 5-stage washing.

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Installations of Downingtown Suction Felt Rolls at various positions on Fourdrinier and Cylinder Machines show 20% to 100% increase in felt life, depending on the condition of the machine parts and the class of stock being handled. These rolls continuously keep the full width of the felt clean and open at all times. Photo below shows an installation on a fourdrinier making book.

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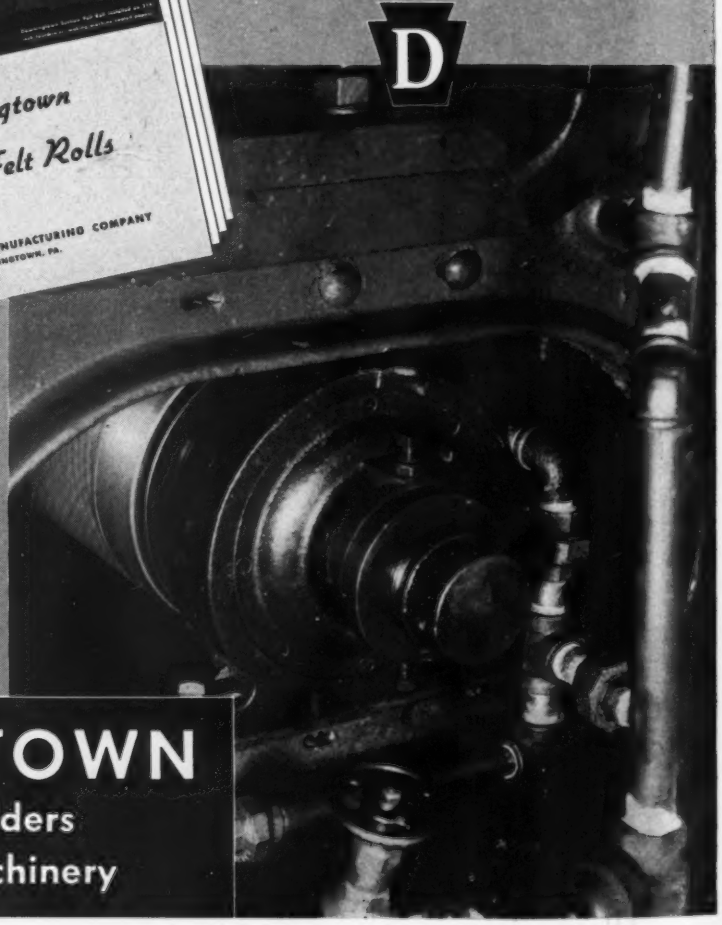

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Paper Making Machinery

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CALENDAR OF COMING EVENTS

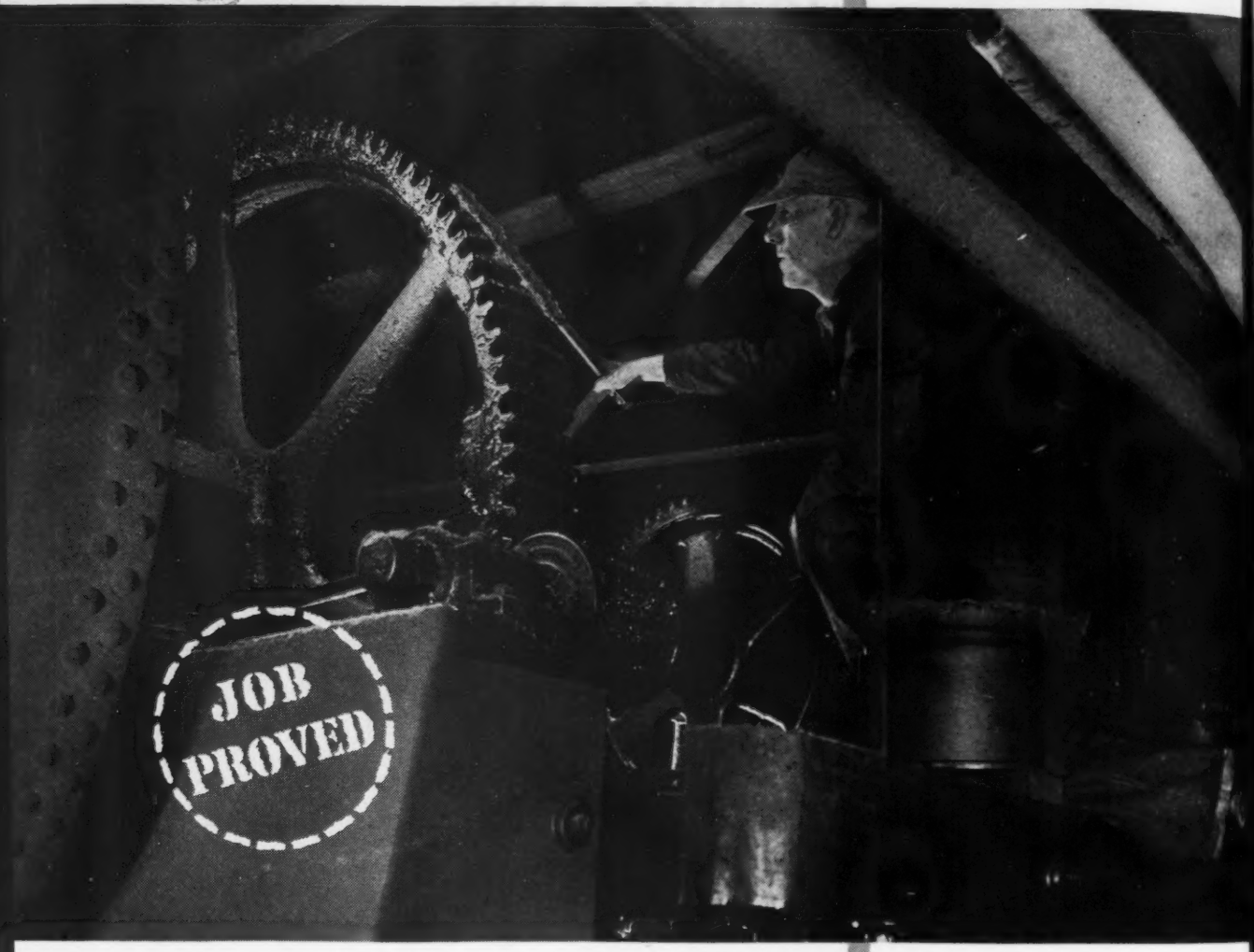
January 28-30—Technical Section, Canadian Pulp and Paper Association, Annual Meeting, Mount Royal Hotel, Montreal, P. Q.

February 23-26, 1948 — Technical Association of the Pulp and Paper Industry, Annual Meeting, Hotel **Commodore, New York City.**

May 18-20, 1948—American Pulp and Paper Mill Superintendents Association, Annual Meeting. Roosevelt Hotel, New Orleans, La.

June 11-12, 1948—Paper & Twine Association, Annual Convention, French Lick Springs, Indiana.

Sinks Its Teeth Into a 50% Saving



SUN PAPER MILL LUBRICANT...

Clings to Digester Gear Teeth in Sulphite Mill, Lasts Longer, Helps to Cut Lubrication Costs

A New England mill, which manufactures absorbent towels and sulphite pulp, had a problem in the lubrication of the big gears on a rotary digester.

Messy black gear compounds of a well-known brand were being used, but they were hard to apply and didn't stay on. To correct this situation, a Sun Engineer was called. After checking all the factors involved, he recommended an extra heavy Sun grease with special adhesive properties.

A saving of 50% in lubrication costs has been effected since the Sun grease was adopted. The Sun product lasts longer, adheres to the gears and does not dirty up the mill.

"Job Proved" Sun lubricants are making records like this in scores of paper mills in many parts of the country . . . helping paper men to cut operating costs, to end maintenance headaches, and to keep machines in first-class condition. For full information and practical advice on lubrication, call your nearest Sun Engineer. Or write Department PT-11.

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INDUSTRIAL PRODUCTS

Paper TRADE JOURNAL

VOLUME 125, NO. 22 REG. U.S. PAT. OFF. NOVEMBER 27, 1947

Withdraw Subpoenas On Canadian Records

WASHINGTON—Grand jury subpoenas designed to produce records of Canadian newsprint interests have been withdrawn. Attorney General Tom C. Clark said the necessary information had been obtained through conferences at Ottawa, and thus the subpoenas would be withdrawn "until further notice." He added that the grand jury now sitting in New York would continue its investigation of the newsprint industry.

Mr. Clark's statement was made through release of a letter he had written to Secretary of State George C. Marshall. This related at length the dispute which began when the New York grand jury sought to obtain the Canadian records by subpoena.

In the course of the document, Mr. Clark revealed that contempt proceedings were once contemplated against companies whose Canadian records were sought. He had asked the advice of the State Department on this point. Mr. Marshall answered that the inquiry had "aroused considerable concern in Canada," but that it was for the Justice Department to decide upon contempt proceedings.

After this, conferences were held at Ottawa between representatives of the Justice Department, the Canadian Department of External Affairs and the Canadian newsprint industry. The information obtained "covered the immediate problems," Mr. Clark stated. He added:

"The conferences also afforded our representatives an opportunity to demonstrate to Canadian representatives that procedure followed in the pending investigation was carefully designed to eliminate from consideration all matters within the scope of Canadian sovereignty and further that, based on the complaints, and previously available information, our inquiries were justifiable."

In 1946, the Attorney General said, his department received numerous complaints from American publishers alleging violations of the anti-trust laws in the newsprint industry. Other complaints had been made to Congressional committees, he added. Some of the complaints argued violation of a 1917 court decree enjoining certain United States and Canadian newsprint interests from engaging in combination and agreements "to fix prices, to restrict production or to allocate customers."

Canada Bars Paper Products To Save Dollar Exchange

WASHINGTON — A wide variety of paper products is now barred from import into Canada from the United States and other countries listed in a recent action of the Canadian government designed to conserve dollar exchange.

Confronted with Britain's decision not to convert sterling into dollars, Canada, with large sterling balances, has found suddenly, that it cannot finance its large import trade with this country until the situation clears, and has taken drastic action shutting out many categories of imports from the United States and all other countries with so-called "hard currency."

Among the paper products now prohibited from entry into Canada from the United States and other listed countries, under this action are: pictorial post-cards, greeting cards and similar artistic cards or folders, finished or unfinished.

Periodical publications, unbound or paper bound, consisting largely of fiction or printed matter of a similar character, including detective, sex, western, and alleged true or confession stories and publications, unbound or paper bound, commonly known as comics, but not including bonafide supplements used with newspapers.

Provided, that the decision of the Minister of National Revenue as to whether or not any publication is included in the foregoing description shall be final and conclusive.

Tarred paper and prepared roofings (including shingles), fiberboard, strawboard, sheathing and insulation, manufactured wholly or in part of vegetable fibres, n.o.p., blotting paper, not printed nor illustrated.

Sandpaper, glass or flint paper, and emery paper or emery cloth.

Roofing and shingles of saturated felt.

Playing cards, in packs or in sheet form, n.o.p., cards and sheets partly lithographed or printed, for use in the manufacture of such playing cards.

Paper hanging or wall papers, including borders or bordering.

Towels, napkins, table covers, tray covers and doilies, of paper; fancy shelf and lace papers; paper handkerchiefs; facial tissues and toilet papers,

(Continued on page 10)

Open House Welcomes N. C. Pulp Co. Guests

PLYMOUTH, N. C.—The North Carolina Pulp Company, a division of Kieckhefer Container Corporation, held "Open House" at its plant here on November 20 for a group of about 78 guests including Governor Cherry and other high officials and prominent business men and industrial leaders of the state to view the results of the company's modernizing program at this time.

The guests were welcomed by H. M. Kieckhefer, president of the Corporation, at an excellent buffet luncheon at the Plymouth Country Club, before being conducted on a tour of the mill. No part of the huge mill was overlooked in the inspection trip which lasted more than three hours. The separate operations of pulp manufacture were viewed in logical sequence, beginning with the conveying of pulpwood from the woodyard to the two huge barking drums, thence to wood washers, chippers, digesters, pulp washers, and bleach plant. A trip through the recovery plant, showing

(Continued on page 15)

H. M. KIECKHEFER

Chemical Group Hears Kress and Heuser

APPLETON, Wis. -- "New Trends in the Evaluation of Chemical Wood Pulps" was the subject of a lecture delivered by Dr. Emil Heuser of The Institute of Paper Chemistry on November 18 at a meeting of the Northeast Wisconsin Section of the American Chemical Society.

The occasion was the seventeenth anniversary of the first meeting of the section, and the meeting was preceded by a dinner honoring the charter members. Dr. H. F. Lewis, Dean of The Institute of Paper Chemistry and first chairman of the section, presided. Other charter members present were S. F. Darling, Robert McMillan, Professor of Chemistry at Lawrence College; J. R. Fanselow, staff superintendent, Kimberly-Clark Corporation; J. O. Frank, head of the Chemistry Department, State Teachers College, Oshkosh; Otto Kress, technical director, The Institute of Paper Chemistry; A. Lewenstein, chief chemist, Appleton Coated Paper Company; and H. A. Rothchild, technical director, Kimberly-Clark Corporation.

Following the dinner Dr. Otto Kress spoke informally on the growth of the pulp and paper industry and the chemical industry during his lifetime, and how economic situations had affected technological developments.

The lecture by Dr. Heuser dealt with information, as yet unpublished, on molecular chain length distribution obtained by fractionation methods applied to certain types of wood pulp and cotton.

Merrimac Division Names Greene to Promotion Post

EVERETT, Mass. — Edmund Greene, formerly of Cambridge, has been appointed as sales promotion and advertising manager of the Merrimac Division of Monsanto Chemical Company by Josiah B. Rutter, vice-president of the company and division general manager.

A graduate of Harvard University with an A.B. in chemistry, Greene worked for three years on Greater Boston newspapers. He was employed for a year by Smith, Kline & French Laboratories, manufacturers of ethical pharmaceuticals, and for eight years by Rohm & Haas of Philadelphia.

While with the latter firm, he served as sales promotion manager of the plastics division, working on advertising publicity and product application.

Greene joined Monsanto's Industrial and Public Relations Department at the company's St. Louis headquarters in June of this year. He is a member of the Society of the Plastics Industry and of the Society of Plastics Engineers.

E. NOBLES LOWE

West Virginia Elects E. Nobles Lowe Secretary

NEW YORK — E. Nobles Lowe, general counsel and public relations director of West Virginia Pulp and Paper Company, was elected secretary of the company at the regular monthly meeting of the board of directors November 19. In his new position, Mr. Lowe succeeds Charles A. Cass, who retired in October after 38 years' service in the office.

Mr. Lowe became general counsel of the company in 1943, and in 1944 assumed the additional duties of public relations director. He holds B.A. and LL.B. degrees from the University of Arkansas.

McGillan Tells of Fire-Fighting Experience

NEENAH, Wis. — Fire-fighters of Kimberly-Clark's Badger-Globe mill were honored at a dinner Thursday evening, November 20, at the Poinsetta Tea Room, the first of two such events. The second is scheduled for December 4.

George McGillan, retired chief of the Appleton fire department and now in charge of fire prevention at all K-C mills, discussed some of his experiences in fighting fires, and E. V. Johnson, of the corporation's industrial department, emphasized the importance of the brigade and of maintaining regular drills and keeping up equipment. Talks were also given by H. B. Palmer, assistant mill manager at Badger-Globe, and Fred Hollenbeck, plant engineer.

Stanley Bennets is mill fire chief, making daily inspection of all fire fighting equipment and organization of and drilling the squad. Eight captains, two from each shift, lead the squad in duty if a call comes in. The department is under the supervision of the Badger-Globe engineering department.

Gormely With Sandy Hill In South American Job

HUDSON FALLS, N. Y. — Michael B. Gormely, for the past two years general superintendent of the Warrensburg Pulp and Paper Corporation mill at Warrensburg and previously paper mill superintendent of the Marinette Paper Company mill at South Glens Falls, has accepted a position with the Sandy Hill Iron & Brass Works as planning and erection engineer for a large South American job. At present, Mr. Gormely is in Hudson Falls working with erection plans on one of the largest and fastest tissue machines to be erected in South America. It is one of several machines being built at Sandy Hill for South America and Mr. Gormely will leave for Buenos Aires in the near future to supervise the starting and operation of the machine for a period of years.

Mr. Gormely has been making paper for the past thirty years, working for such companies as the Eastern Corporation, Bangor, Me.; International Paper Company at Orono and Rumford, Me.; and the Scott Paper Company at Chester, Pa. While at the Scott Paper Company plant in Chester, he helped install, operate and supervise the operation of the widest and fastest tissue paper making machines in the United States.

Mr. Gormely went with Veldown Paper Company in South Glens Falls in 1939 making the highest grade of facial tissue and other grades of lightweight tissues. After the Veldown mill was taken over by Scott, Mr. Gormely continued as superintendent during the changeover to Scott tissue products.

Chicago D-C Elects Monsanto's Pauley

CHICAGO—Gerald F. Pauley, general branch manager of Monsanto Chemical Company's Organic Chemicals Division sales office here, has been elected president of the Chicago Drug and Chemical Association. He will take office January 1.

Pauley, who has been in charge of Monsanto's Chicago office for the past 13 years, is a resident of Wilmette, Ill., and a graduate of the University of Illinois, a member of the American Chemical Society, the American Association for the Advancement of Science, the Chicago Chemists Club, the Chicago Perfumery Soap and Extract Association and the Chicago Association of Commerce. He has been associated with Monsanto since 1927 when he was employed as a chemist at the company's headquarters in St. Louis.

Missisquoi Moves Boston Office

BOSTON—The local office of Missisquoi Corporation, of which Joseph D. Starr, Jr., is the New England representative, has been removed to larger quarters at 88 Broad Street.

Giegengack Reports GPO Volume Doubled

WASHINGTON, D. C. — Government Printing Office production for the fiscal year 1947, according to Public Printer Augustus E. Giegengack's annual report, shows a $53 million volume of public printing, which is more than double prewar requirements. While the present figure is a third less than it was in the busiest war year, there is no evidence that further reduction of volume can be expected in the near future if at all. The Congressional Record reached a number of new highs and Congressional printing generally appears to be on the increase. Orders for some of the Executive Departments, including naturally War and Navy, have declined but printing needs of the Veterans Administration, the Department of Agriculture and the Post Office Department are even greater than in wartime.

The Public Printer devotes the first pages of his report to the difficulties encountered by the Government in the procurement of paper. Quarterly bid openings are yielding only a fraction of requests. Current annual use of paper is reported to be at the rate of 180 million pounds.

Although rising costs of labor and material are boosting Government Printing Office charges to the departments, the Public Printer lists many effective methods he has adopted to counteract these increased costs. Notable among these is the extensive research program undertaken jointly with Printing Industry of America, Inc. Aside from the new fields of study to be invaded, the report shows Uncle Sam's big printing plant to be abreast of the most modern developments in the industry.

Government Printing Office cost accounting and production control procedures assure that each printing job carries every charge that may correctly be placed against it and at the same time guarantee the most economical method of production that is possible.

Shortages of qualified personnel persist in the technical divisions, but the Office's reduced needs for other classes of workers are being met satisfactorily. There were 7,955 employees on the Office rolls at the end of the fiscal year, including 983 in the field duplicating plants, operated by the Treasury Department prior to being placed under the Public Printer on July 1, 1946.

Commercial procurement during the year was about $15 million and is expected to remain near this level. The wartime difficulties of securing adequate contract sources no longer exist, the report states.

One of the most striking developments within the Office during the year was the emergence of the Public Documents Division as a self-sustaining unit. Its receipts from public sale of official publications, more than $3 million for 37 million copies, enabled it to return to the Treasury an amount greater than its entire appropriation, while absorbing the cost of handling a wide department and Congressional distribution program. Its new and better located bookstore on North Capitol Street is expected to offer greater incentive to purchase of public documents. One of the plans for the future is the establishment of regional bookstores.

Other plans of the Public Printer include a program of plant and equipment modernization, acquisition of additional storage and production space, and a review of the printing and binding laws, looking toward their revision in accordance with current needs and practices.

Eastern Corp. Mills Acquire Cutting Rights

NEW YORK — The production facilities of Eastern Corporation are operating at full capacity and demand is so heavy that output remains on an allocation basis, Claude B. Morgan, president, said at a meeting of directors held in New York late last week. The corporation, which has mills at South Brewer and Lincoln, Me., has signed a contract for cutting rights of pulpwood on 110,000 acres in Maine, he reported. This supply, he added, can furnish a large part of the pulpwood needs of the Lincoln mill for many years to come.

The company's new power plant at Brewer is now in full operation, Mr. Morgan reported. It was most fortunate, he said, that this power supply was provided for at this time, because of the very acute power shortage in the State of Maine resulting from the inadequate rainfall during the year.

In addition to Maine, the corporation has extensive holdings of woodlands in Nova Scotia. A large percentage of wood used in its plants comes from its own properties.

Eau Pleine Reservoir Is Rising Slowly

WAUSAU, Wis. — The Eau Pleine reservoir of the Wisconsin Valley Improvement Company was filled to 40 percent of capacity, and northern Wisconsin reservoirs were filled to an average of 27 percent of their combined capacities on November 16, after a total of 278 million cubic feet of water was drawn from the reservoirs for hydroelectric purposes.

Inflowing streams added 485 million cubic feet to the reservoirs during the week, showing a net gain of 207 million cubic feet in reserves, bringing the latter to a total of 5,203 million cubic feet, in comparison with 14,215 million cubic feet on the same date last year.

Michigan Syndicate Buys Plainwell Mill

KALAMAZOO—The Kalamazoo *Gazette* and eight other Michigan daily newspapers have purchased the Michigan Paper Company at Plainwell with the purpose of increasing the present limited supply of newsprint available to the publishers. Dwight L. Stocker, president of the company, declared last week that negotiations for purchase of control of the Plainwell company have been in progress several weeks and were concluded Monday afternoon by the transfer of stock to the new owners. The company will continue under the direction of the present management.

The decision to purchase the three-machine mill, officials of the company state, stems from the imperative need of the publishers to augment their regular contract supply of newsprint paper in order to keep pace with the steady circulation growth of their papers and the expanding service requirements of readers and advertisers. One of the three paper machines now in operation will be devoted to the manufacture of newsprint from deinked newspapers, while the remaining facilities of the plant will continue to produce other grades of paper to maintain service to the company's regular customers. The company will continue its established policy of progressive plant improvement and development, President Stocker states.

Dwight L. Stocker assumed the presidency of the company on December 11, 1935, following the death of George W. Gilkey on October 6, 1935, of injuries received in a motor accident. Under his direction, the company grew rapidly. With Stocker as president and general manager, the executive committee of the company was composed of Ethol Stone, Allegan, and Merrill W. Taylor, Kalamazoo.

Members of the board at the time of transfer of ownership were: H. Clair Jackson, George A. Pelgrim, Ethol W. Stone, Chas. W. Woodhams, William J. Lawrence, Merrill W. Taylor, Dwight L. Stocker.

Details for the transfer of stock from the old company to the new ownership were in the hands of Leo A. Swiat of the firm of Olmsted and Mulhall.

Frampton Talks Before A.S.M.E.

ERIE, Pa.—A. E. Frampton, advertising manager and assistant sales manager of the Hammermill Paper Company, was guest speaker at a recent meeting of the Erie Section of the American Society of Mechanical Engineers. He gave a talk on the uses of paper and showed a film on the history of the Hammermill plant.

Canada's Needs Rule Its Fiscal Policy

TORONTO, Ont.—The two important fiscal announcements made by the Canadian Government on November 17 leave the pulp and paper industry about where it has been for many months — the leading source of United States dollars. In fact, closer examination of the results of the Geneva conference on multilateral trade, which at first glance, appeared to offer great opportunities to Canadian manufacturers of all kinds, it is now generally agreed, will produce little immediate improvement in Canada's trade balances.

During recent years Canada has emerged from an agricultural to an industrial economy and is now an important exporting country, though farm products are still a very important factor in the country's trade with other nations. Because much of Canada's industrial advance has been occasioned by the establishment in Canada of branch plants of United States industries to get the advantage of imperial preferences in tariffs with the British Empire, many component parts of the products made by these Canadian branches still come from the parent companies and are paid for in United States dollars. This has been one of the chief causes of the dwindling of Canada's dollar reserve. In short, Canada has been either buying too much in the United States or selling too little, or both. This is a complaint common to most countries and was greatly accentuated during and since the war. Canadian manufacturers agree that the international attempt at Geneva to free the channels of trade was even more successful than many had hoped and should do much for the resumption of international trade as soon as the world gets settled down to the business of living instead of international quibbling.

However, now that tariff schedules seem likely to give Canada a break, it develops that Canada does not produce sufficient steel for her own requirements and it is generally agreed by those in that branch of industry that if the steel were available to them they could take immediate advantage of the new tariffs.

No one expected the new trade arrangements to give any immediate help to relieve the critical dollar shortage so within three or four hours after Prime Minister King announced from London the trade agreements reached, his minister of finance was on the air in Canada announcing the drastic steps deemed necessary to preserve Canada's dollar reserve.

These restrictive measures place many items on a quota and ban some other things, mostly in the luxury category, or at least things we can well do without and suffer no hardships. Just so that Canadian manufacturers cannot take advantage of the scarcity situation created by the restrictions, a 25 percent excise tax has been clapped onto the sale price of the items affected by the ban.

As was expected, the new regulations are far from pleasing everyone and it is already virtually impossible to get accommodation either to or in the national capital so great is the rush for details, concessions and protests.

Right Hon. C. D. Howe, who has been such an outstanding success in Canada's reconstruction program, will have charge of the major aspects of the new arrangements, while Kenneth W. Taylor, assistant deputy minister of finance and recently chairman of the Wartime Prices and Trade Board, will head the Emergency Import Control Division set up to administer the new regulations on prohibited and "quota" imports. Top United States executives who have branch plants in Canada will be invited to Ottawa shortly to discuss with Mr. Howe and his colleagues and other Canadian authorities ways and means of achieving a better balance in their Canadian operations. These branch plants represent an investment of $2.3 billions and number approximately 2,000 plants. This immense investment is at the moment in some jeopardy through the loss of Empire markets under the new agreements for lower preferences.

There will be no interference with capital projects now under way in Canada. What it is hoped will be achieved by the suggested talks will be the postponement or alteration of future planning so that the maximum conservation can be achieved. The emphasis will be on projects which encourage development of Canadian resources or which can be expected to provide Canada with dollar exports or to save dollar imports.

While nothing specific could be learned, it is generally believed an effort will be made to encourage pulp manufacturers in Canada to further process their product and thus gain additional United States dollars.

Chemical Society Honors Allen Abrams for Ability

WAUSAU, Wis.—Allen Abrams, vice-president and technical director of Marathon Corporation, has been named one of the "ten ablest chemists or chemical engineers" in the field of industrial and engineering chemistry in the United States. The selection resulted from a reader poll by the Chemical Bulletin, which is published by the Chicago Section of the American Chemical Society. The selections, published in the November issue were in the various fields of chemistry, "based purely on scientific ability."

Washington Publishes New Tariff Schedules

WASHINGTON—Woodpulp and standard newsprint imports into the United States were retained in duty-free status in the new reciprocal trade agreements made public this week by the State Department.

On some other papers and paper products, reductions were ordered in U. S. duties. On paper, paperboard, and pulpboard, embossed, die-cut, cut or stamped into designs, shapes or articles for a particular use, including filter paper in circles or disc form, duty is reduced to 15 per cent ad valorem from 30 per cent.

Pulpwood in rolls, processed and unprocessed, were as follows: unprocessed pulpboard in rolls for use in manufacture of wallboard, left unchanged at 5 per cent; on processed board duty is reduced to 10 per cent from 15.

Book and printed paper, not coated, unchanged; carbon tissue, coated or uncoated; weighing less than 10 pounds per ream—prior to the present agreement, duty on carbon tissue weighing not over 6 pounds per ream, valued at not over 15 cents per pound was 3 cents per pound and 10 per cent ad valorem; valued at more than 15 cents a pound, duty was 4 cents a pound and 15 per cent; the rates on both value brackets are now 3 cents a pound and 10 per cent ad valorem. On carbon tissue weighing over 6 but less than 10 pounds, new duty, 2½ cents a pound and 7½ per cent ad valorem.

Duty on China clay or kaolin reduced to $1.25 per ton from $1.75.

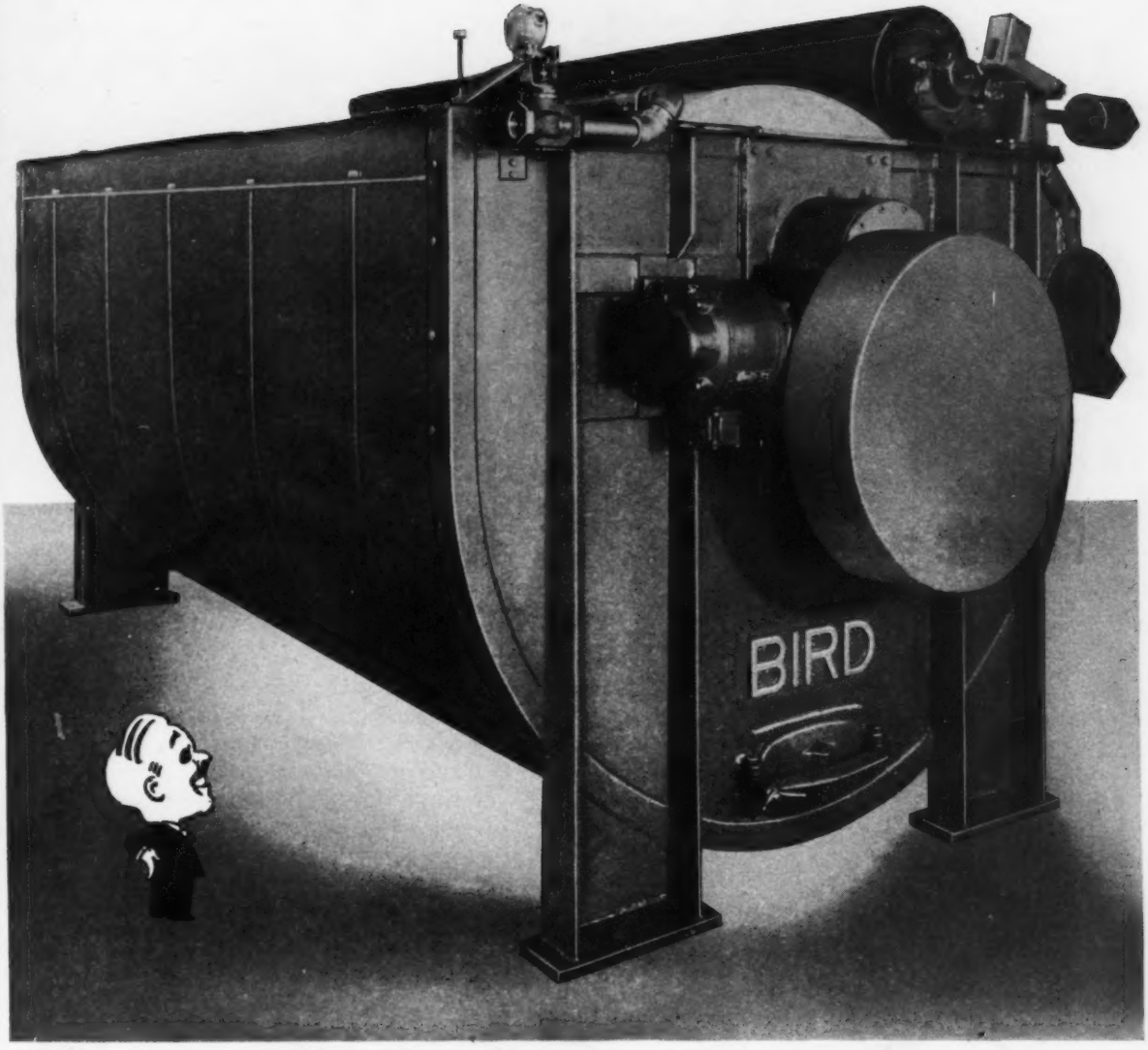
Canada Saves Exchange Bars Paper Products

(Continued from page 7)

not including such materials in jumbo rolls; cups, dishes or plates, forks, spoons and drinking straws, made of paper, cardboard, or of vegetable fibres; paper envelopes; correspondence and printed letterhead papers, not including plain unprinted and typewriter or copying papers; creped tissue paper and manufactures thereof; wrapping paper, including box covering paper and wrappers, printed, embossed or otherwise decorated; Christmas seals, stickers, tags and enclosure cards, printed, embossed or otherwise decorated; card and other games, score reckoners, score pads, tallies and place cards, of paper or cardboard; festivity, carnival and celebration supplies and decorations of paper or cardboard, including costumes, hats, caps, headbands, masks, horns, serpentines and confetti; gummed paper; blank books.

Wrapping paper of all kinds, not pasted, coated or embossed.

Containers wholly or partially manufactured from fibreboard or paperboard.



THIS BIG BIRD SAVE-ALL PRODUCES BIG RETURNS

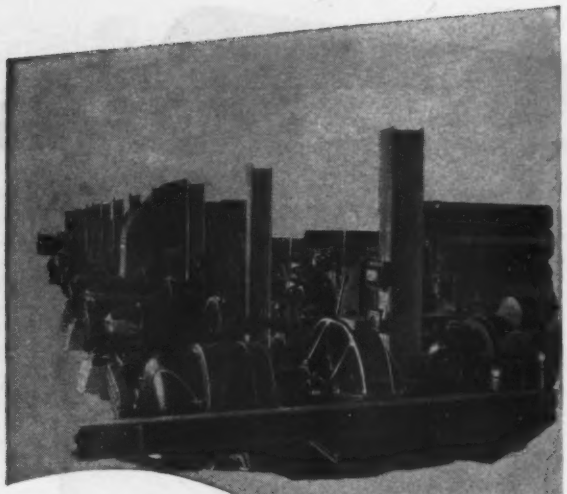
This whopping big Save-All handles 750 GPM. It's the largest of four sizes to meet any capacity requirement.

Today, no mill can afford to go without an efficient white water recovery system. Most mills have found that the Bird Save-All system assures maximum net return per pound of fibre recovered.

May we submit recommendations and estimates?

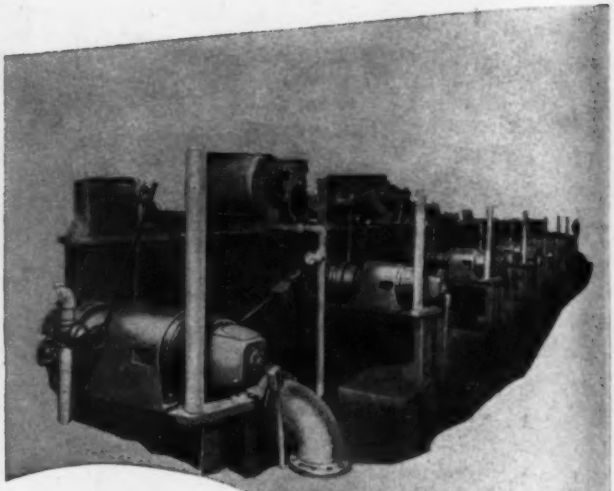
BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS



Precise from start to finish!

G-E ELECTRONIC AMPLIDYNE SECTIONAL DRIVES assure precise speed control—from head box to reel. Higher running speeds are made practical because speeds between sections are held closely. The control is highly responsive to load changes; hence fewer paper breaks. On changing to different grades and weights, you save time, make less broke.



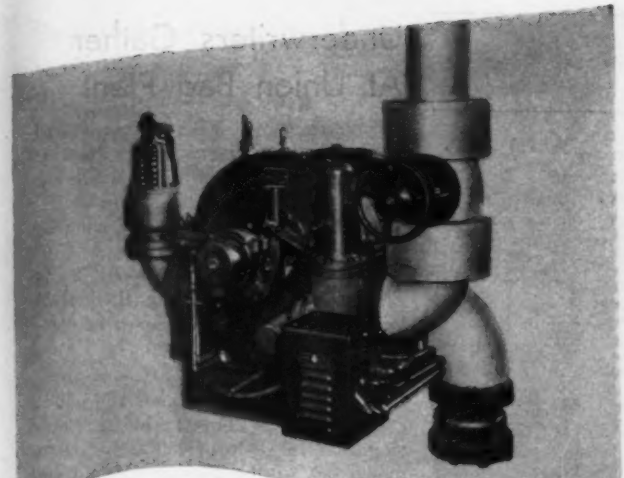
Helpful for "babying" felts

G-E HELPER DRIVES furnish the torque to take all the drive load off the felts, regardless of operating speeds or speed changes. Or they can be co-ordinated with the suction-box vacuum or other variables so as to counterbalance changes in the load. Felts are more fully protected from strain and friction, draw is more accurately regulated, and acceleration and deceleration are smoothly accomplished.

One of these

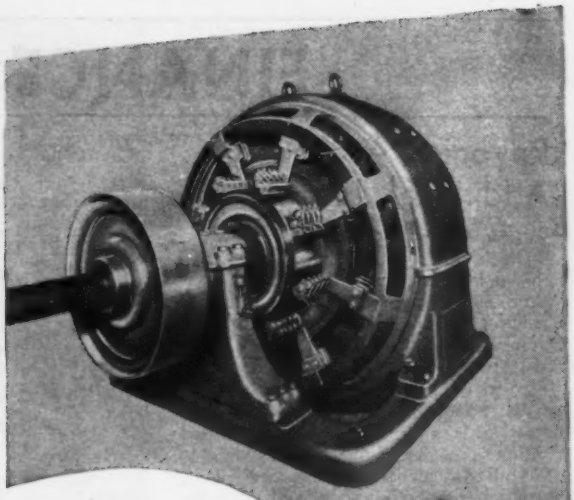
MEANS

No matter what paper machine you're using—no matter what the operating conditions are—you'll find that the drive you need to cut costs is one of the four basic types described above. General Electric makes all four types—and that's a good reason why you have much to gain by bringing your drive problems to us. With a wide selection of drives to choose from you can get the right



Smooth when you change speed

G-E MECHANICAL-DRIVE TURBINES, with electric governing systems, can be provided with smooth speed changes over a range as high as 30 to 1. The desired speed is attained with no hunting and is held with an accuracy of 1/4 of one per cent under normal operating conditions. The electric governor on this drive is housed in protective enclosures which will resist entry of moisture in damp atmospheres.



Right for board or tissue

G-E SINGLE-MOTOR DRIVES use an electronic-tube, amplidyne-control combination to provide speed ranges up to 14 to 1 for a wide variety of paper-making operations. The drive is readily adaptable to any primary source of power. It can be directly connected to the lineshaft or operated through a speed-reducing device. The drive is economical in operation, over wide speed ranges.

Drives—

LOWER COSTS FOR YOU

combination of speed-control accuracy and sensitivity. You can get practically any speed range you want too. Finally, you can select a drive that's easier to operate, occupies less floor space, and requires less attention. Why not talk it over soon with a General Electric paper-mill specialist? *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

462-30

FINANCE

Rayonier Acquires Additional Timber

NEW YORK — President Edward Bartsch of Rayonier Incorporated disclosed late last week that negotiations have been completed for acquisition of practically all the Polson Logging Company interests with its vast tracts of timberlands and logging facilities on the Olympic Peninsula, State of Washington.

By this purchase, well over two billion feet of timber are added to Rayonier's already large and fast-growing timber holdings, and the company's three northwest pulp mills are thus assured of an adequate future supply of the large quantities of wood that are required to keep them in continuous and full-scale production.

The Polson properties are adjacent to Rayonier's present holdings and are ideally located with respect to Rayonier's Washington mills. More than 50,000 acres of Rayonier's new timberlands consist of virgin timber located in Jefferson, Clallam, and Grays Harbor counties. These stands represent extensive areas in which the timber already has reached maturity, and is ready to be felled to make way for new growth. These forests will thus provide an immediate supply of wood for Rayonier's northwest mills. Logging conditions in these stands of timber are said to be considerably better than the average found in the same general area. The Polson Company is now operating three large logging camps in these sections and these operations will continue under direction of the new owners.

In Grays Harbor county, Rayonier also acquires about 70,000 of "reproduction lands"—acres on which trees are now being regrown to provide for the future.

The Polson railroad, an important and most essential part of the purchase, is 125 miles long and, together with Rayonier's present railroads, provides the only existing outlet for a large part of the publicly owned timber on the western Olympic Peninsula. While the construction of highways might afford other outlets, distances are great and use of the combined railroads would be the most practical and economic means of transportation.

The Polson Company owns, or has under lease, extensive tidelands on the Hoquiam River, and also owns most of the adjoining uplands. Its booming grounds in these tidelands are equipped for large-scale handling of logs. These assets, important in getting logs to mills at lowest cost, are part of the Rayonier purchase, as are the Polson investments in the Ozette Railway Co. and the Bay City Lumber Co.

Gaylord Container Votes 25 Cents Extra

BOGALUSA, La.—The board of directors of Gaylord Container Corporation declared the quarterly dividend of 37½ cents and an additional 25 cents per share on the common stock to bring the declarations for the year to the current rate of $1.50. Both are payable December 15 to shareholders of record December 3.

Underwriters Gather At Union Bag Plant

SAVANNAH, Ga.—Representatives of some twenty investment banking houses, headed by Morgan, Stanley & Company, who will underwrite the issuance of 211,000 shares of common stock of the Union Bag & Paper Corporation, spent Tuesday (Nov. 18) in Savannah familiarizing themselves with all operational phases of the company's local plant.

Donald J. Hardenbrook, vice-president in charge of woodlands and public relations, pointed out at a business session that the sale of additional common stock of the company would enable Union Bag to increase its power facilities and make other improvements at the Savannah plant, all tended to further increase the efficiency of the operation.

Executives of the Union Bag & Paper Corporation who met with the representatives of the investment firms were H. S. Daniels, executive vice-president; G. W. E. Nicholson, vice-president in charge of manufacturing; Mr. Hardenbrook; Malcolm S. Black, treasurer; T. T. Dunn, resident manager of the Savannah plant and the five division heads of the local operation.

Following a tour of all departments of the plant the visiting investment bankers were guests of Union Bag at luncheon at the De Soto Hotel. A business session was held during the afternoon, presided over by Mr. Hardenbrook.

FINANCIAL RECORD OF THE WEEK

New York Stock Exchange

High, Low and Last for Week Ending November 22, 1947

STOCKS

	High	Low	Last
A. P. W.	5¼	5	5
Armstrong Cork Co.	49¼	48⅛	48¾
Armstrong Cork Co., pf.	99	97½	97¾
Celotex Corp.	28⅛	27⅜	28
Celotex Corp., pf.	20⅜	20¼	20¼
Certain-Teed Products Corp.	18⅝	17½	18
Certain-Teed Products Corp., pf.	....	....	....
Champion Paper & Fibre Co.	23	22½	22⅞
Champion Paper & Fibre Co., pf.	105⅜	104⅞	104⅞
Congoleum Nairn Co.	33¼	32¾	32¾
Container Corp. of America	42½	40	42½
Container Corp. of America, pf.	97	96	97
Crown Zellerbach Co.	33⅜	32⅝	33⅜
Crown Zellerbach Co., pf. 4.20	102¼	101¾	102¼
Crown Zellerbach Co., 4 pf. 4	124⅝	122	124⅝
Dixie Cup Co.	37½	36	37½
Dixie Cup Co., A	54½	54½	54½
Flintkote Co.	38½	36⅝	37⅛
Flintkote Co., pf.	103½	103½	103½
Robert Gair	10¼	9⅝	10
Robert Gair, pf.	19¾	19¾	19¾
International Paper Co.	59⅜	56	56⅞
International Paper Co., pf.	99⅜	99⅜	99⅜
Johns-Manville Corp.	44⅜	42⅝	43⅛
Johns-Manville Corp., pf.	....	....	....
Kimberly-Clark Corp.	24½	23¾	23¾
Kimberly-Clark Corp., pf.	108¾	107	108¾
Mac Andrews & Forbes	41	38¾	41
Mac Andrews & Forbes, pf.	....	....	....
Marathon Corp.	21	20⅜	21
Mead Corp.	22	21½	21¾
Mead Corp., pf. 4¼	94	93	94
Mead Corp., pf. 2	47	45¾	47
National Container Corp.	14¾	14⅛	14⅛
Paraffine Companies, Inc.	77	73	77
Paraffine Companies, Inc., pf.	....	....	....
Rayonier, Inc.	31⅜	29¾	30⅜
Rayonier, Inc., pf.	36¾	36¼	36¾
Ruberoid Co.	67¼	65¾	67½
St. Regis Paper Co.	10⅞	10⅝	10¼
St. Regis Paper Co., pf.	91	90¾	90¾
Scott Paper Co.	45	44	44
Scott Paper Co., pf.	97¼	96	96
Sutherland Paper Co.	41½	41½	41½
Union Bag & Paper Corp.	34¼	32⅞	33⅜
United Paperboard Co.	17⅛	16⅛	16⅛
United Wallpaper	6¾	6	6¼
United Wallpaper, pf.	40	40	40
U. S. Gypsum Co.	105½	104½	105¼
U. S. Gypsum Co., pf.	....	....	....
West Virginia Pulp & Paper Co.	45	42½	44¼
West Virginia Pulp & Paper Co., pf.	....	....	....

BONDS

Celotex Corp., 3¼s '60	....	....	....
Certain-Teed Products Corp., 5⅓s '53	....	....	....
Champion Paper & Fibre Co., 3s '65	....	....	....
Mead Corp., 3s '68	....	....	....

New York Curb Exchange

High, Low and Last for Week Ending November 22, 1947

STOCKS

	High	Low	Last
Great Northern Paper Co.	47	45¼	47
Taggart Corp.	10½	10¼	10½

BONDS

American Writing Paper Co., 6s '61	....	....	....

Open House Welcomes N. C. Pulp Co. Guests

(Continued from page 7)

the smelters, evaporators, and causticizing units plus the turpentine stills and tall-oil recovery equipment, greatly impressed the visitors with the tremendous scope of technical accomplishment which is exhibited in a modern pulp mill.

A side trip showed the modern machine shop with its complete assortment of lathes, shapers and roll grinders. The guests were especially interested in a regrooving operation on a stainless steel refiner disc.

From the pulp mill the tour continued to the paper mill where .016 milk bottle stock was being made on Fourdrinier at the rate of about 110 tons per day. The companion to this machine is a seven-cylinder board machine with a capacity of about 150 tons per 24 hours.

The new Fourdrinier paper machine, called "The Kraftsman" is one of the largest in existence, with a trim of approximately 200 inches and a maximum speed of 1,600 feet per minute and is now producing kraft liner board at the rate of about 500 tons per day.

The machine received its name through a contest conducted among the employes of the mill. The winner received a $100 award for his suggestion.

A product display, showing various types of corrugated and solid boxes as well as several sizes of milk containers made at the mill completed the visit.

The plant is regarded as an outstanding example of good planning. There is a feeling of roominess and cleanliness. Nothing is crowded. All equipment is readily accessible and there is plenty of room for additional units. Such an arrangement makes good housekeeping a much easier job.

The final phase of the inspection tour consisted of a visit to the Forestry department and included a demonstration of planting pine seedlings by machine as well as an exhibition of maps and photographs showing various plantations. Cross-sections of seven-year-old trees having diameters of six to eight inches showing the high rate of growth, were also exhibited.

At the conclusion of the inspection tour, the group returned to the Country Club where refreshments were served. During the banquet which followed, J. A. Auchter, vice-president of the company, introduced the speakers, including Governor Cherry, President H. M. Kieckhefer and Kennard Trowbridge, supervisor of Forestry operations.

In his talk, Governor Cherry emphasized the fact that the people of North Carolina were fortunate in having industries like the North Carolina Pulp Co. which increased the wealth of the state not only by the value of its product but by providing employment for so many people and giving the farmers an opportunity to add pulpwood to their list of profitable crops.

J. A. Auchter

Mr. Kieckhefer described some of the incidents leading to the choice of Plymouth, as the site of the mill and then touched briefly on the growth of the mill from a production of 200 tons of pulp per day from its founding in 1937 to its present capacity of about 700 tons per day.

Mr. Trowbridge briefly described their wood procurement and tree planting operations and told about the encouragement and assistance being given to farmers who wished to grow trees for pulpwood.

New England Trade To Meet December 5

BOSTON—A regional meeting of the entire membership of the New England Paper Merchants Association is scheduled to be held at the Parker House for Tuesday, December 9. The opening session at 3 p.m. will be followed by sessions for both the Fine Paper Division in the Hawthorne Room and the Wrapping Paper Division in the Old Boston Room. These meetings will be confined to members only.

At 5:30 there will be a social session in the Roof Ball Room, to which members will be permitted to invite mill representatives as their guests. At 6:30 dinner will be served, accompanied by music and tenor solos. The speaker will be Wiliam Stapels, assistant secretary of the American Paper and Pulp Association, of New York. After his talk technicolor sound moving pictures will be presented, one film of the 1947 World Series and the other "Twenty Centuries of Cordage." A representative of the National Paper Trade Association will participate in the business session.

Michigan Mill Men View New Equipment

KALAMAZOO—The "electrical" meeting of the Michigan division of the American Pulp and Paper Mill Superintendents Association at the Park-American Hotel Thursday evening attracted 122 members and guests who heard two speakers. The presiding officer was William Astle, and O. W. Callighan introduced the two who addressed the gathering, W. W. Cronkhite, Schenectady, N. Y., and W. A. Mosteller, Detroit.

A display of electrical equipment provided by the General Electric Company, especially pointed toward paper mill appliances and controls, was on view in the basement of the hotel for two days. It was seen by more than 300 men, according to the expert in charge, R. M. Chermak, Grand Rapids.

Mosteller talked of the display, describing the equipment and the advances made in recent years in the use of electrical controls in paper manufacture. Cronkhite, commercial consultant of the industrial manufacturers' division of GE, near retirement, reminisced about his 40 years in the trade.

Special guests, because of Cronkhite's appearance, were a number of "old-timers" in the paper business in the valley. Among them were Peter J. Massey, St. Regis Paper Company; "Pop" Stewart, KVP consultant; C. M. Daniels, Lee Paper Company, Vicksburg; Arthur Cole, Rex Paper Company; R. L. Barton, Michigan Paper Company; Carl Swanson, Allied Paper Mills; and L. E. Brefogle, Draper Felt Company.

In view of GE's prominence in the program, there were ten representatives from that company present. They were the speaker, W. W. Cronkhite; H. S. Taylor, David G. Gearhart, R. M. Chermak, R. B. McIlvain, and Merritt Lawrence, all of Grand Rapids, the latter manager of the office in that city; W. A. Mosteller, T. G. Glenn and C. C. Adams, Detroit, the latter manager of the office there, and R. A. Cliff, South Bend.

Corporation Body Denies Virginia Freight Rise

RICHMOND, Va. — Rejecting the application of seven railroads in Virginia for a hike in the rates on pulpwood and extract wood, the State Corporation Commission said "the evidence indicates that it is not now proper to increase intrastate rates on these commodities."

"Extract wood," said the commission's order, "is related and should not bear an increase unless pulpwood rates are increased. From the testimony before this commission it is of the opinion that the rates on pulpwood and extract wood should not bear any increase permitted in this order.

IMPORTS

NEWSPRINT

N. Y. Sun, Stuart Prince, Cornerbrook, N. F., 1434 rolls.
World Telegram, Stuart Prince, Cornerbrook, N. F., 718 rolls.
Clinton Paper Corp., Stuart Prince, Cornerbrook, N. F., 895 rolls.
R. A. Olsen, Inc., A.C.D., Donnacona, 385 rolls.
H. G. Craig Co., Donpaco, Donnacona, 336 rolls.
Bankers Trust Co. (Hutchinson, Kansas), Bell of the Sea, London, 87 rolls.
R. A. Olsen, Inc., G.T.D., Donnacona, 371 rolls.
News Syndicate Co., Colabee, Baie Comeau, 6787 rolls.
Journal Gazette (Fort Wayne, Ind.), Westerdam, Rotterdam, 212 rolls.
H. G. Craig Co., G.G.D., Donnacona, 379 rolls.
R. A. Olsen, Inc., International No. 1, Gatineau, 304 rolls.
Malmar Paper Co., Union Victory, Antwerp, 65 rolls.
N. Y. Journal American, Markland, Liverpool, N. S., 1098 rolls.
Herald Tribune, Markland, Liverpool, N. S., 1775 rolls.
World Telegram, Markland, Liverpool, N. S., 715 rolls.
Brooklyn Eagle, Markland, Liverpool, N. S., 763 rolls.
Herald Statesman, Inc., Markland, Liverpool, N. S., 42 rolls.
Richmond Newspapers, Inc., Markland, Liverpool, N. S., 1879 rolls.
(———), Bloomington Victory, Kotka, 1192 rolls.

WRAPPING PAPER

Jay Madden Corp., Bloomington Victory, Helsingfors, 447 rolls.
Manufacturers Trust Co., Bloomington Victory, Gothenburg, 27 rolls.
National City Bank, Bloomington Victory, Gothenburg, 199 rolls.

SULPHITE PAPER

Parsons & Whittemore, Inc., Bloomington Victory, Gothenburg, 203 rolls.
J. B. Lynch, Bloomington Victory, Gothenburg, 204 rolls (glazed white).

WALLPAPER

A. Bomier Publishing House, Bloomington Victory, Gothenburg, 1 cs.
W. G. Jones, Titan, Havre, 8 cs.
W. H. S. Lloyd & Co., Bell of the Sea, London, 10 bls., 1 cs.

PHOTO PAPER

American Express Co., Bell of the Sea, London, 248 cs. (base paper).

PRINTING PAPER

Watch Tower Bible & Tract Society, Ranenfjord, Oslo, 197 rolls.

DRAWING PAPER

Meadows Wye & Co., America, Southampton, 5 cs.

LITHO PAPER

Elizalde & Co., Stag Hound, Hong Kong, 10 cs.

PARCHMENT PAPER

J. E. Bernard & Co., Wacosta, Antwerp, 3 cs.

GUMMED PAPER

B. F. Drakenfeld & Co., Fort Musquarro, Liverpool, 57 cs.

RICE PAPER

George Posner, Golden West, Shanghai, 20 cs.

SURFACE COATED PAPER

Gevaert Co. of America, Union Victory, Antwerp, 1 cs.

COATED PAPER

F. P. Gaskell Co., Tahsinia, Glasgow, 32 cs. (for cigarette tips).

BOXBOARDS

Jay Madden Corp., Bloomington Victory, Helsingfors, 85 bls. (bleached).

MISCELLANEOUS PAPER

Public National Bank Trust Co., Bloomington Victory, Gothenburg, 165 rolls.
Chase National Bank, Bloomington Victory, Gothenburg, 56 rolls.
National City Bank, Bloomington Victory, Gothenburg, 527 rolls.

RAGS, BAGGINGS, ETC.

New England Waste Co., Stag Hound, Shanghai, 200 bls. cotton waste.
American Express Co., Fort Musquarro, Liverpool, 48 bls. new wool rags.
New England Waste Co., Ferncliff, Shanghai, 300 bls. cotton waste.
Joseph Stein, Mormacport, Buenos Aires, 12 bls. rags.
Camden Fiber Mills, Marine Flier, Bombay, 100 bls. cotton waste.
E. J. Keller Co., Inc., Marine Flier, Bombay, 257 bls. jute rags, 200 bls. old jute rags.
Darmstadt Scott & Courtney, Marine Flier, Bombay, 100 bls. old jute rags.
Castle & Overton, Inc., Marine Flier, Bombay, 100 bls. old just rags.
New England Waste Co., Marine Flier, Bombay, 100 bls. old jute rags, 530 bls. cotton waste.
Guaranty Trust Co., Marine Flier, Leghorn, 151 bls. old dark cotton rags.
A. W. Fenton Co., Marine Flier, Leghorn, 271 bls. old dark cotton rags.
1st National Bank Chicago, Damitry Danskoy, Leningrad, 4833 bls. cotton linters, 3556 bls. cotton waste.
Amtorg Trading Corp., Damitry Danskoy, Leningrad, 2185 bls. cotton waste.
New England Waste Co., Derwent Hall, Tuticorin, 862 bls. cotton waste.
Continental Bank Trust Co., High Point Victory, Alexandria, 103 bls. hessians.
(———), High Point Victory, Alexandria, 63 bls. hessians.
Manufacturers Trust Co., High Point Victory, Genoa, 235 bls. old waste bagging.

OLD ROPE

(———), Bucyrus Victory, Calcutta, 125 bls. hemp rope cuttings, 110 bls. old hemp rope cuttings.

CASEIN

American Cyanamid & Chemical Corp., Mormacport, Buenos Aires, 1500 bags (ground lactic).
Casein Co. of America, Div. Borden Co., Mormacport, Buenos Aires, 200 bags (ground lactic).

GLUESTOCK

John Gorvers, Santa Sofia, Barranquilla, 31 rolls.

WOODPULP BOARDS

Jay Madden Corp., Bloomington Victory, Kotka, 1164 rolls, 478 bls. (solid white).

NEW YORK IMPORTS

WEEK ENDING NOVEMBER 22, 1947

SUMMARY

Newsprint	19,437 rolls
Wrapping Paper	673 rolls
Sulphite Paper	407 rolls
Wallpaper	10 cs., 10 bls.
Photo Paper	248 cs.
Printing Paper	197 rolls
Drawing Paper	5 cs.
Litho Paper	10 cs.
Parchment Paper	3 cs.
Gummed Paper	57 cs.
Rice Paper	20 cs.
Surface Coated Paper	1 cs.
Coated Paper	32 cs.
Boxboards	85 bls.
Miscellaneous Paper	748 rolls

ALBANY IMPORTS

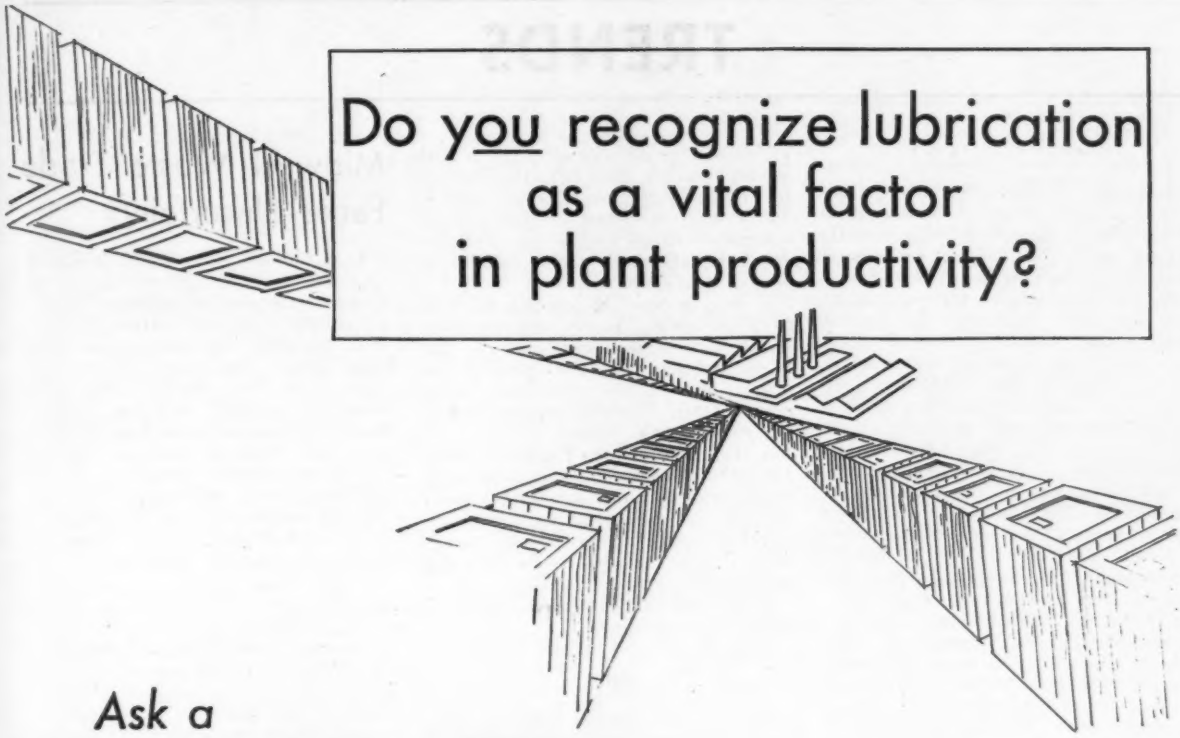
WEEK ENDING NOVEMBER 22, 1947

Bulkley Dunton Pulp Co., Inc., Consul Corfitzon, Stugsund, 1524 bls. dry sulphite pulp, 250 tons.
Cellulose Sales Co., Consul Corfitzon, Stugsund, 5675 bls. air dry sulphite pulp, 1117 tons; 1875 bls. air dry sulphate pulp, 369 tons.
Cellulose Sales Co., Consul Corfitzon, Sundsvall, 6300 bls. kraft sulphate pulp, 1030 tons; 3130 bls. dry sulphite pulp, 535 tons.
Bulkley Dunton Pulp Co., Inc., Consul Corfitzon, Iggesund, 1750 bls. prime bleached sulphite pulp, 350 tons; 1395 bls. prime bleached sulphate pulp, 279 tons.
Gottesman & Co., Inc., Consul Corfitzon, Iggesund, 275 bls. prime bleached sulphite pulp, 55 tons.
Perkins Goodwin & Co., Consul Corfitzon, Iggesund, 1 cs. woodpulp samples.

BOSTON IMPORTS

WEEK ENDING NOVEMBER 22, 1947

Concentra Shipping Co., Marine Flier, Genoa, 340 bls. dark cotton rags.



Do you recognize lubrication as a vital factor in plant productivity?

Ask a

GULF LUBRICATION ENGINEER

to show you how improved lubrication has increased production and reduced costs in scores of plants

IT IS A WELL ESTABLISHED FACT that lubrication is essential to machine operation—that no machine could function without it. Not so widely recognized is the important influence of lubrication on costs and profits.

Proper lubrication helps increase plant efficiency in three ways: Helps increase production—machines run more smoothly, more accurately; helps reduce down time—more dependable operation and fewer interruptions to production; helps reduce maintenance costs—excessive wear is eliminated and fewer repairs are necessary.

To make sure that lubrication in your plant is on a par with other vital production factors, call in a Gulf Lubrication Engineer. Discuss with him the possibility of increasing your production and lowering your maintenance costs through selection of the most suitable lubricants and the best methods of application. He will show you how scores of plants have benefited materially through this modern approach to greater efficiency.

The services of a Gulf Lubrication Engineer—and the more than 400 Gulf quality oils and greases—are quickly available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office today.

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Division Sales Offices:

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GULF INDUSTRIAL LUBRICATION

TRENDS

Office of the PAPER TRADE JOURNAL,
Wednesday, November 26, 1947.

Basically conditions within the industry remain unchanged with supplies of container and paperboard reportedly caught up with demand, with kraft demand so far ahead of supply that mills are hesitating to release production data lest they draw in greater demand, and a leading national editor questioning the ethics of manufacturers who allegedly divert pulp into huge supplies of facial tissue where greater profits exist and leaving shortages on toilet tissues. . . . The Scandinavian "black market" on newsprint is reported as having lost its stamina and dropped to $200 a ton, whereas a few spot shipments are being offered here in New York for well over that figure.

Shortages on wrapping paper and grocery bags seem here to stay. Present production on wrapping is approximately one-half the demand, delivery only on allocation. No new production is seen. New kraft mills are directing production into board and boxes, gummed paper, multiwall and wet-strength bags. Production costs and marketing conditions are responsible for more or less permanent shift in wrapping procedure for the small grocery and department stores, a new era for which there is no answer evident.

A few changes in price are reported which, however, do not reflect a general advance but rather a narrowing of the spread between the lowest and the highest prices on those grades.

Firsthand information has come in about prospective 1948 pulp shipments from Sweden. There still remain unresolved five important factors which may affect the volume of pulp exports to the United States:

1. Foreign exchange conditions.
2. Supply situations on Swedish coal, wood, hydro-electric power, and labor.
3. Import and export regulations.
4. Effects of United States aid to Western European countries under the Marshall plan.
5. Political situation in Europe, eastern and western.

Under existing supply situations of fuel and labor, it does not seem probable that Sweden will be able to increase her production in 1948 over the present 70 percent of capacity. Exports of all grades of pulp to the United States in 1947 may reach a total of 550,000 pounds, against 446,000 for 1946; and it is believed that a possible 25 percent increase over this amount may be expected in 1948. This increase is desired by the Swedish government because of the need of dollars, and shipments to soft currency countries may be curtailed somewhat in favor of United States markets. Swedish mills, however, are anxious to maintain well-established trade in other markets with whom bilateral trade agreements exist; but unless such countries are able to fulfill their prescribed schedules, Swedish pulp will go elsewhere. Reaction from the Marshall plan would be effected at this juncture.

A drop in Swedish prices is not seen as a possibility, partly because there seems no possible increase in the rate of production, nor any marked improvement on the elements which govern costs. The much-rumored price rise may become factual. Neither is it felt that the quantity of pulp which Northern Europe could import to us could seriously affect our market under existing economic conditions, since the world shortage under normal conditions is not expected to be met for many, many years.

A rise in Canadian pulp prices is rumored as imminent.

Index

The index of general business activity for the week ended November 15 retained the standing of the previous week at 148.3, compared with 143.1 for the corresponding week of 1946. The index of paperboard production declined to 179.4 from 182.4 in the preceding week, compared with 167.4 in the corresponding week of 1946.

Paper production for the week ended November 15 was estimated at 108.0 percent compared with 108.9 (revised figure) for the preceding week, with 104.9 for the corresponding week of 1946, with 96.4 for 1945, and with 90.3 for the corresponding week of 1944.

Paperboard production for the week ended November 15 was 101.0 percent of capacity, compared with 102.0 percent for the preceding week, with 101.0 for the corresponding week of 1946, with 95.0 for 1945, and with 96.0 for the corresponding week of 1944.

Waste Paper

The market here is fairly steady with no change in price in lower grades and none expected in higher grades while the demand for pulp so far exceeds the supply.

Rags

Prices are strong under steady demand. Rises are recorded on all grades and old domestic cottons are reclassified to show today's grades and prices. Foreign linens are so high that no trading is reported. With the uncertainty about the jute market, bagging prices are firm and likely to rise. Roofing rags have shown some fluctuation but are now holding steady with mills buying again.

Midwest Waste Trade Faces Uncertainty

CHICAGO—It is virtually impossible to develop a coherent picture of the Chicago waste paper market. There is reportedly a lot of confusion arising from the price situation on old corrugated paper. One waste paper dealer reports that the price is "closer to $23 than it is to $27" and that a figure around $25 would be perhaps "the most accurate." Others maintain that the $27 a ton figure is correct though the continued heavy offerings of old corrugated would seem, in the opinion of most market students, to make the lower figures more realistic.

Supply was quoted as very heavy and the mills were said to be having no real difficulty in getting the corrugated they needed at a figure below the $27 point. Other waste paper lines seemed to be little affected by the interesting developments in the old corrugated field. Supplies were reported as not as plentiful as earlier with No. 1 news holding at $17 to $19 as perhaps the steadiest item in the list. No. 1 mixed was not in quite so good a position but those reporting here in answer to price queries said that the price was holding fairly well at around $13 to $14 a ton.

The general picture in the paper trade market here remained virtually unchanged. Less optimism was voiced over potential shipments of Swedish pulp and the effect of the Marshall Plan and the President's proposals to put it through all were construed as forces in strengthening demand through an increase in shortages. No paper merchants here felt that business in general would do other than "boom" as the result of the proposed loans of money and equipment to Europe.

Power Company Is Held Not Under Regulation

WISCONSIN RAPIDS, Wis. — Utility regulations by the Wisconsin Public Service Commission do not affect the Wisconsin River Power Company, the commission announced last week at Madison, in response to a request for a declaratory ruling.

The company was organized early this year by Consolidated Water Power and Paper Company, the Wisconsin Power and Light Company and the Wisconsin Public Service Corporation to build and operate the Petenwell hydroelectric plans on the Wisconsin river near Necedah, Wis., and to provide power to these three firms.

PRICES

With the elimination of price controls on paper, pulp, rags and other materials, the quotations given below once more become indicative of trends in an open market. At the moment they can be of little more, for, while some volume business still is being done under contract at the figures given below, fluctuations representing special conditions are too varied and too frequent to permit prices to be given as representing a wholly stabilized market.

Paper

(Delivered New York)

Standard News, per ton—
Roll, contract ....$87.50 to $90.00
Sheets .....$109.00 " —

Kraft—per cwt.—Carload Quantities
Zone A Deld. 40 lb. base wgt.
Superstandard
Wrapping ..... $9.00 to —
No. 1 Wrapping.. 6.75 " 7.50
Standard Wrapping 6.50 " 7.25
Standard Bag ... 6.00 " 7.00

Tissues—Per Ream 24x36 (480) 11 lb. Zone 1.
Wh. No. 1 Frd.... $1.75 to $2.00
Wh. No. 1 M. G. 1.75 " 2.00
Wh. No. 1½..... 1.60 " —
Wh. No. 2 ..... 1.55 " —
Kraft Anti-Tar .. 1.38½ " —
Kraft Unbl. ..... 1.85 " —
Manila No. 2 .... 1.62 " —

Toilet—Per Case of 100 rolls—1 M Sheets.
Unbleached ..... $5.50 to $6.40
Bleached ..... 6.50 " 7.60

Paper Towels—Per Case of 3750—
Zone 1.
Wh. Jr. M'tif'd 9¼x9½ $4.85
Br. Sr M'tif'd 10x12 ..... 3.45
Br. Jr. M'tif'd 9½x9¼ 2.95
Br. Jr. Sgl. fold 10x10¼ 3.10

Manila—per cwt.—C. l. f. a.
No. 1 Jute Tag ..$14.50 to —
Reg. Jute Manila 13.25 " $15.50
No. 1 Manila .... 9.75 " —

Boards, per ton—
News ..... $92.50 " —
Chip ..... 90.00 " —
Sgl. Mla. Lt Chip*102.50 " —
White Pat. Coated*120.00 " —
Kraft Liners 42 lb. 100.00 " —
Binders Boards ..126.00 " —

* Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following prices are representative of distributors' resale prices, all deliveries in Zone 1: Rag Content Bonds and Ledgers—

White, Assorted Items Bonds, per cwt.

	Carton	4 C't'n	Ton
100% Rag Ext. No. 1	$55.00	$50.80	$48.70
100% Rag	48.25	44.55	42.70
75% Rag	38.00	34.55	33.10
50% Rag	31.50	28.75	27.50
25% Rag	28.00	25.50	24.50

Ledgers, per cwt.

100% Rag Ext. No. 1	$54.25	$50.00	$48.00
100% Rag	$47.50	$43.90	$42.10
75% Rag	37.50	34.55	33.10
50% Rag	32.25	29.40	28.25
25% Rag	28.75	26.15	25.10

Sulphite Bonds and Ledgers—
White, Assorted Items Bonds, per cwt.

No. 1	$19.25	$17.50	$17.00
No. 2	18.25	16.50	16.00
No. 4	17.50	16.00	15.25

Ledgers, per cwt.

No. 1	$20.25	$18.35	$17.60
No. 2	19.25	17.50	16.80
No. 4	18.50	16.90	16.10

Free Sheet Book Papers—
White, Cased Paper

(Per cwt.)	Case	Ton
No. 1 Glossy Coated..	$20.40	$19.55
No. 2 Glossy Coated....	19.15	18.30
No. 3 Glossy Coated....	18.40	17.60
(Per cwt.)	Case	Ton
No. 1 Antique (Watermarked)	$15.90	$15.15
No. 2 Offset	14.15 to 17.90	13.65 to 17.10
A Grade E. F.	14.90	14.25
A Grade S. & S. C.	15.40	14.65
B Grade E. F.	Nominal	
B Grade S. C.	Nominal	

Wood Pulp

Domestic mill contract prices delivered with varying freight allowances.

	Per Short ADT
Groundwood	$75.00 to $81.00
Unbleached Sulphite.	115.00 " 117.00
Bleached Sulphite ...	121.00 " 130.00
Bleached Soda	120.00 " —
Bleached Sulphate ..	Nominal
Unbleached Sulphate Northern	Nominal
Unbleached Sulphate Southern	Nominal

Canadian Quotations

Prices delivered with varying freight allowances unless otherwise specified:

	Per Short ADT
Select Unbleached Kraft (no freight allowance)	125.00 " —
Reg. No. 1 Kraft	112.50 " 115.00
Unbleached Sulphite.	115.00 " 117.00
Bleached Sulphite .	125.00 " 155.00
Glassine Unbleached Sulphite (no freight allowance)	112.00 " —
Bleached Soda	120.00 " —
Groundwood	75.00 " 85.00
Siderums Pulping News	75.00 " 80.00
Hardwood and Specialty Grades	Nominal

Swedish Quotations
On dock, Atlantic Ports

	Per Short ADT
Bleached Kraft	170.00 to 195.00
Bleached Sulphite ..	175.00 " 185.00
Unbleached Sulphite.	145.000 " 175.00
Unbleached Kraft....	140.00 " 165.00

Finnish Quotations
On dock, Atlantic Ports

	Per Short ADT
Bleached Sulphite ..	$175.00 to —
Unbleached Sulphite	145.00 " 150.00
Unbleached Sulphate	140.00 " —

New Domestic Cotton Cuttings

(Prices delivered Mill Plus Dealer's Commission)

White Shirt	$12.50 to $13.00
Light Silesias	9.00 " 9.50
Unbleached Muslin ..	12.50 " 13.00
White Back Blue Overalls	9.00 " 9.50
Blue Overalls	9.00 " 9.50
Unbl. Fancy Shirt...	7.00 " 7.50
Light Percales	7.50 " 8.00
Light Prints	7.50 " 8.00
No. 1 Washables	6.50 " 7.00
Bleachable Khaki	7.00 " 7.50
Unbleachable Khaki ..	5.50 " 6.00
Cottonades	6.50 " 7.00

Old Domestic Cotton Rags

(F.O.B. Shipping Point Plus Dealer's Commission)

	Per 100 lbs
Whites Miscellaneous	4.75
Blue Overalls	4.75
Thirds and Blues Repacked	3.00
No. 1 Roofing Rags	2.00
No. 2 Roofing Rags	1.90
No. 3 Jute Bagging	1.80
No. 4 Brussels and hard back carpets	1.80
No. 5A Roofing Rags	1.80

New Foreign Cotton Cuttings

(Prices delivered Mill)

	Per 100 lbs.
New Dark Cuttings....	$6.00 to —
New Mixed Cuttings...	nominal
Light Silesias	nominal
Light Flannelettes	nominal
New White Cuttings ..	nominal
Fancy Shirt Cuttings ..	nominal
Light Prints	nominal
Bleachable Khaki, No. 1	7.00 " 7.50
Unbl. Khaki, No. 1....	6.25 " 6.75

Old Foreign Rags

(Prices to Mill, f.o.b. dock, N.Y.)

	Per 100 lbs.
No. 1 White Linens...	$14.00 to 16.00
No. 2 White Linens...	12.00 " 13.00
No. 3 White Linens...	8.00 " 9.00
No. 4 White Linens...	8.00 " 9.00
No. 1 White Cottons...	10.00 " 12.00
No. 2 White Cottons...	8.00 " 9.00
No. 3 White Cottons...	6.50 " 7.00
No 4 White Cottons...	5.00 " 5.50
Extra Light Prints...	7.50 " 8.00
No. 1 New Light Prints	6.25 " 6.75
Med. Light Prints....	5.25 " 5.75
Dutch Blue Cottons....	5.25 " 5.50
Checks and Blues.....	4.00 " 4.25
Linsey Garments	3.00 " 3.75
Dark Cottons	2.20 " 2.60
Old Shopperies	2.50 " 3.00
New Shopperies	2.50 " 3.00

Bagging

(Prices to Mill, f.o.b. N. Y.)

	Per 100 lbs.
Foreign Gunny, No. 1..	$5.00 to $5.50
Domestic Gunny, No. 1	5.50 " 5.75
Light Wool Tares...	4.50 " 4.7
Heavy Wool Tares.....	5.50 " 5.75
No. 1 Scrap Bagging ..	4.75 " 5.00
Foreign Manila Rope ..	6.00 " 6.75
Domestic Manila Rope	5.75 " 6.50
Jute Strings	4.50 " 5.00
No. 1 Sisal Strings ..	5.50 " 6.00
Mixed Strings	1.75 " 2.50
Mixed Strings, Outthrows	.90 " 1.10

Waste Paper

Base Prices to Mills for Average Packings

(Dollars Per Ton)
F.o.b. New York, Baled

No. 1 Hard White Envelope Cuts, one cut	155.00 to 165.00
No. 1 Hard White Envelope Cuts	145.00 " 155.00
No. 1 Hard White Shavings, unruled.	145.00 " 155.00
No. 1 Hard White Shavings, ruled ..	110.00 " 130.00
Soft White Shavings, one cut	145.00 " 155.00
No. 1 Soft White Shavings	135.00 " 145.00
Soft White Shavings, Misc.	125.00 " 135.00
No. 1 Fly Leaf Shavings	45.00 " —
No. 1 Groundwood Fly Leaf Shavings	30.00 " —
No. 1 Heavy Books & Magazines	27.00 " —
Mixed Books	15.00 " 20.00
No. 1 White Ledger	85.00 " 90.00
New Manila Envelope Cuttings, one cut.	100.00 " 110.00
New Manila Envelope Cuttings	65.00 " 75.00
Extra Manilas	25.00 " 30.00
Mixed Kraft, Env. & Bag Cuttings	75.00 " 85.00
Kraft Envelope Cuttings	110.00 " —
Triple Sorted, No. 1 Brown Soft Kraft.	65.00 " 75.00
New Kraft Corrugated Cuttings	85.00 " 90.00
No. 1 Assorted Old Kraft	55.00 " 60.00
New Jute Corrugated Cuttings	27.00 " —
Old 100% Kraft Corrugated Containers	45.00 " 50.00
No. 1 News	13.00 " 15.00
No. 1 Mixed Paper ..	11.00 " 13.00
Box Board Cuttings..	12.00 " 14.00
White Blank News...	75.00 " 80.00
Overissue News	18.00 " 20.00
Old Corrugated	25.00 " 26.00
Mill Wrappers . .	23.00 " 25.00

Twines

All Prices Nominal, F.o.b. Mill

(Soft Fiber)

Coarse Polished— India	.28¼ to .29¼
Fine Polished— Fine India	.31¼ " .36¼
Unpolished— Paper Makers	.24 " .25½
Tube Rope	.24¼ " .26¼
Wrapping	.30 " .32
Cotton	.55 " .70

(Hard Fiber)

Mex. Sisal	.21 " .31
Manila (Reprocessed)	.28 " .30

(American Hemp)

Polished Hemp	.36¼ " .42
Unpolished	.29¼ " .34

PHILADELPHIA

Domestic Rags (New)

(F.O.B. Eastern Shipping Point)

Shirt Cuttings— New White No. 1..	.11 to .12
New White No. 2..	nominal
Light Silesias	.07½ " .08
Black Silesias, soft	.06½ " .07
New Unbleached ..	.10½ " .11¼
Washable Prints ..	.06½ " .07
Washable No. 1....	.05 " .05½
Blue Overall	.07½ " .08
Cottons—According to grades—	
Washable Shredding	.03½ " .04
Fancy Percales	.06¾ " .07¼
New Black Soft ...	nominal
Khaki Cuttings—	
Unbleachable Cotton Cuttings	.06 " .06½
Bleachable Cotton Cuttings	.07 " .07½
Men's Corduroy ..	.05½ " .06
Ladies' Corduroy ..	.05 " .05½
Cottonades	.05½ " .06

Domestic Rags (Old)

(F.O.B. Eastern Shipping Point)

White No. 1—Repacked	4.50 to 5.00
Mixed White	4.00 " 4.33
White No. 2—Repacked	3.50 " 3.75
Thirds and Blues— Miscellaneous	2.25 " 2.50
Repacked	2.75 " 3.00
Roofing Stock— Foreign No. 1.....	nominal
Domestic No. 1....	1.85 " 1.90
Domestic No. 2....	1.75 " 1.80
Roofing Bagging ..	1.65 " 1.70
Old Manila Rope....	6.25 " 6.50

Bagging

(F.O.B. Eastern Shipping Point)

Gunny No. 1— Foreign	nominal
Domestic	4.75 to 5.25
No. 1 Clean Bright— Sisal Strings	.04 " .04½
No. 2 Clean Bright— Sisal Strings	.03 " .03¼
Sisal Jute	.02¾ " .03
Scrap— No. 1	4.25 " 4.75
No. 2	1.75 " 2.00

Wool Tares, heavy	4.75	"	5.00
New Burlap Cuttings	6.00	"	6.50

Old Papers

(F. o. b. Phila.)
Mill Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	$100.00	to	$115.00
No. 1 Hard White Shavings, unruled	100.00	"	—
Soft White Shavings, one cut	90.00	"	95.00
White Blank News	70.00	"	75.00
Soft White Shavings	80.00	"	—
No. 1 White Ledger	80.00	"	85.00
Ledger, Colored	67.00	"	70.00
No. 1 Heavy Books & Magazines	24.00	"	26.00
Overissue Magazines	nominal		
New Manila Envelope Cuttings	80.00	"	—
No. 1 Assorted Old Kraft	60.00	"	65.00
No. 1 Mixed Paper	11.00	"	12.00
Box Board Cuttings	10.00	"	11.00
Kraft Corrugated Cuttings	90.00	"	100.00
Old Corrugated	24.00	"	26.00
Overissue News	20.00	"	22.00
No. 1 News	13.00	"	15.00

BOSTON

Old Papers

(F.o.b. Boston)
Mill Prices, Baled

No. 1 Hard White Shavings, unruled	6.25	to	6.75
No. 1 Hard White Shavings, ruled	6.00	"	6.50
Soft White Shavings, Misc.	5.25	"	5.50
No. 1 Fly Leaf Shavings	1.75	"	1.85
No. 2 Fly Leaf Shavings	1.65	"	1.75
No. 1 Groundwood Fly Leaf Shavings	1.75	"	2.00
No. 2 Groundwood Fly Leaf Shavings	1.50	"	1.75
Mixed Colored Shavings	2.00	"	2.25
New Manila Envelope Cuts, one cut	4.50	"	4.75
Hard White Envelope Cuts, one cut	6.00	"	6.50
Triple Sorted No. 1 Brown Soft Kraft	3.75	"	4.00
Mixed Kraft Env. & Bag Cuttings	4.00	"	4.25
Kraft Envelope Cuttings	3.75	"	4.00
No. 1 Heavy Books & Magazines	1.25	"	1.75
New Manila Envelope Cuts, one cut	—	"	—
New Manila Envelope Cuttings	4.00	"	4.25
White and Colored Tabulating Cards	4.00	"	4.50
Groundwood Tabulating Cards	1.50	"	1.75
White Blank News	2.25	"	2.50
No. 1 Assorted Old Kraft	3.50	"	—
No. 1 Mixed Paper	.65	"	.75
Overissue News	1.00	"	1.25
Box Board Cuttings	.60	"	.70
New Corrugated Cuttings, Kraft	2.75	"	3.00
Old Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.10	"	1.25
Jute Corrugated Cuttings	1.07½	"	—
Paper Strings	2.00	"	2.25

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	—	to	4.75
Domestic	—	"	4.75
Sisal Rope No. 1	6.00	"	—
Sisal Rope No. 2	5.50	"	—
Mixed Rope	5.25	"	—
Mixed Strings	2.00	"	2.50
Transmission Rope—			
Foreign	(nominal)		
Domestic	3.00	"	3.50
Manila Rope—			
Foreign	(nominal)		
Domestic	6.25	"	—
Soft Jute Rope	5.00	"	5.25
Jute Carpet Threads	6.00	"	—
Bleachery Burlap	8.50	"	9.00
Scrap Burlap—			
Foreign	—	"	4.75
Domestic	—	"	4.87½
South America	5.25	"	—
Wool Tares—			
Foreign	4.75	"	—
Domestic	4.75	"	—
Aust. Wool Pouches	5.00	"	5.25
New Zealand Wool Pouches	5.25	"	5.50
New Burlap Cuttings	6.00	"	6.50
Heavy Baling Bagging	5.25	"	5.75
Paper Mill Bagging	3.50	"	3.75
No. 1 Roofing Bagging	1.75	"	—

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.08	to	—
Fancy Percales	07½	"	.08
New White No. 1	.11	"	.11½
New Light Flannelettes	.08	"	.08½
Canton Flannels, Bleached	.10	"	.11
Underwear Cuttera, Bleached	.10	"	.11
Underwear Cuttera, Unbleached	.11	"	.12
Silesias No. 1	.08	"	.08½
New Black Silesias	.05	"	—
Red Cotton Cuttings	.05	"	—
Blue Overalls	.08½	"	.09
Soft Unbleached	.11	"	.12
Blue Cheviots	.08½	"	.09
Fancy	06	"	—
Washable	.06	"	—
Khaki Cuttings	.06½	"	.07½
Corduroy	.03½	"	—
Khaki Canvas	.06¼	"	.06½
B. V. D. Cuttings	.10½	"	.11¼

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.80	to	—
Miscellaneous	3.20	"	—
White No. 2—			
Miscellaneous	2.65	"	—
Twos and Blues, Repacked	2.20	"	—
Old Blue Overalls	2.25	"	2.50
Thirds and Blues, Repacked	2.20	"	—
Miscellaneous	1.80	"	—
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	4.00	"	—
No. 2	1.75	"	2.00
No. 3	1.35	"	—
No. 4	1.35	"	—
No. 5, Quality A	1.35	"	—
Quality B	1.20	"	—
Quality C	.95	"	—
Old Manila Rope	6.00	"	—

Foreign Rags

(F. o. b. Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)
Mill Prices, Baled

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	$110.00	to	$120.00
No. 1 Hard White Shavings, unruled	105.00	"	115.00
No. 1 Soft White Shavings	80.00	"	95.00
No. 1 White Ledger	55.00	"	55.00
No. 1 Heavy Books & Magazines	40.00	"	43.00
White Blank News	65.00	"	—
Mixed Kraft Env. & Bag Cuttings	75.00	"	85.00
No. 1 Assorted Old Kraft	45.00	"	55.00
Overissue News	28.00		
No. 1 News	17.00	"	19.00
No. 1 Mixed Paper	13.00	"	14.00
Old Corrugated	25.00	"	27.00
Mill Wrappers	22.00	"	

MARKETS

BLANC FIXE—Market steady. Deliveries fair, and supplies adequate. Pulp is currently quoted at $77.50 per ton in barrels, car lots at works, and $82.50 l.c.l., f.o.b. works.

BLEACHING POWDER—Buying active. Market continues tight. Shortage of metal containers. Quotations are unchanged. Prices range from $3.50 to $4 per 100 pound drums l.c.l., works.

CASEIN—No improvement in market condition. Prices strong. Buying slow. Current prices on processed acid precipitated casein are 30 to 33 cents per pound for domestic grades and 29½ to 31 cents for imported grades, f.o.b. shipping point.

CAUSTIC SODA—Market strong. No improvement in supply seen. Serious shortage. Solid caustic is reported at $2.85 per cwt.; flaked and ground is quoted at $3.25 per cwt. in 400 pound drums, $3.75 per cwt. in 100 pound drums—car lots at works; liquid 50% in tank cars at $2.25 per cwt.; liquid 73% in tank cars at $2.35 per cwt. at works.

CHINA CLAY—Market steady, domestic grades in good supply. Domestic filled clay is currently $10 to $13 per ton, car lots, coating clay $15 to $30, imported clay from $18 to $35 export warehouse.

CHLORINE—Supply extremely tight. Continued shortage of tank cars aggravates situation. Heavy demand exceeds available supply. Quantities unchanged. Dealers allocating. Currently quoted at $2.25 per cwt. in single unit tank cars, and at $2.55 to $3.75 per cwt, in multi-unit tank cars, f.o.b. works.

ROSIN—Active domestic demand. Prices strong. Export inactive. Gum rosin in drums per 100 pounds net, in yard, New York car lots, B, D, E, F, $9.50; G, H, I, K, M, N, $10.65; WG, $10.75; WW, $10.85. Wood rosin, per 100 pounds, net, f.o.b., l.c.l., N. Y., B, $6.45; FF, $7.95; G, H, I, K, M, $10.25; N, $10.30; WG, $10.50; WW, $10.66; X, $10.76.

SALT CAKE—Demand continues stronger than supply with slight improvement in shipments. Prices remain unchanged. Domestic salt cake is quoted at $20 to $26.

SODA ASH — No improvement in supply situation. Heavy demand. Current prices, car lots, per 100 pounds, are as follows: in bulk, $1.10; in paper bags, $1.30; and in barrels, $1.80.

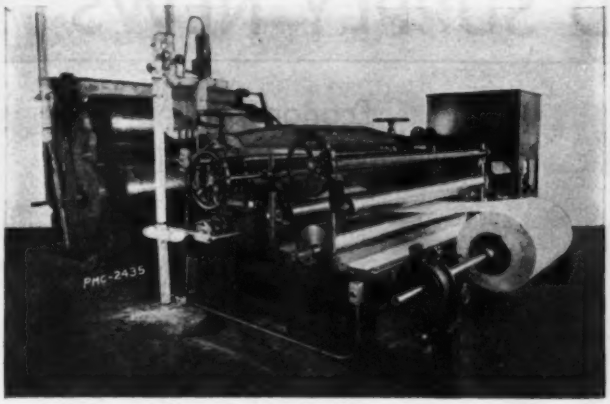
SODIUM BICARBONATE—Supply good. Reported at $1.85 per cwt. paper bags, carload lots.

STARCH—Demand active. Supply tight. Production moving steadily. Export good. Prices unchanged. Pearl grade quoted at $6.52 per 100 pounds, powdered starch at $6.63 per 100 pounds, car lots, Chicago.

SULPHATE OF ALUMINA — Supply ample. Prices firm. Quotations continue unchanged. The commercial grades are quoted at from $1.15 to $1.30 per 100 pounds, in bags, car lots, f.o.b. works. Iron free is quoted at $2 per 100 pounds in bags, car lots, at works.

SULPHUR—Demand steady. Supplies ample. Annual contracts are quoted at $16 to $18 per long ton, f.o.b. mines; the price f.o.b. at Gulf ports is $17.50 to $19.50 per long ton.

TALC—No improvement seen in domestic market. Demand far in excess of supply. Domestic grades are currently quoted at $21 per ton in mines; Canadian at $35 and up per ton. All prices in car lots.



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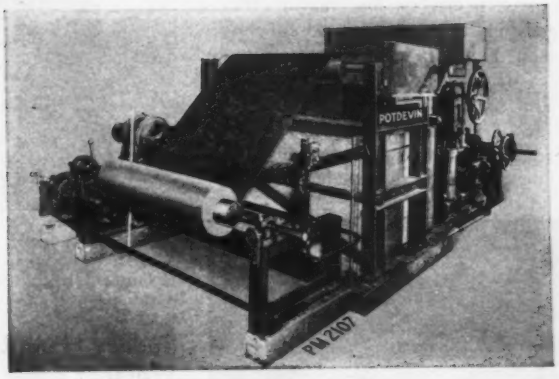
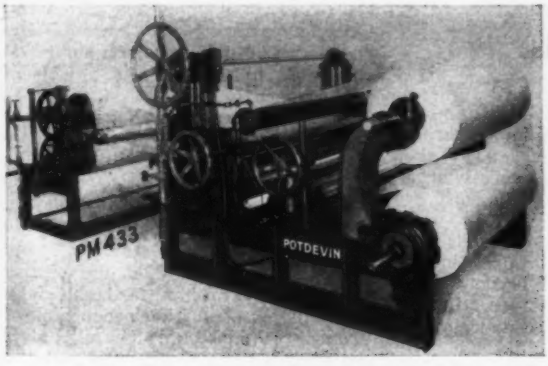
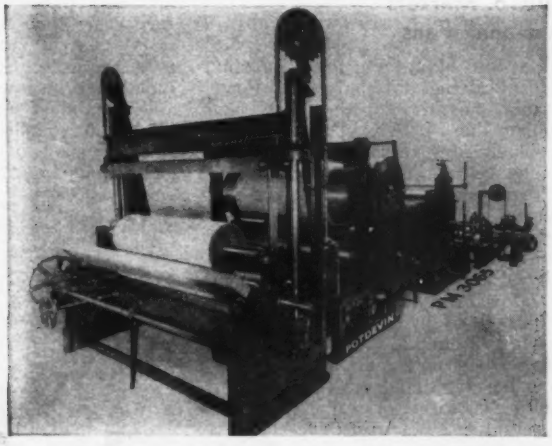
Ready for full speed, trouble free operation, the above POTDEVIN Wax Machine installation is equipped with permanent steam and water connections, convenient electrical controls, and other accessories necessary for efficient waxed paper production.



Used the world over for diversified types of waxing and impregnating, POTDEVIN Waxers feature massive construction, extra heavy squeeze rollers, ball and roller bearings, and large finishing rollers for longer web cooling contact.



Three basic widths 48", 60", and 76" comprise the regular POTDEVIN Wax Machine line. Each machine waxes the full web width. No trim necessary.



POTDEVIN has been designing and manufacturing squeeze roll type, roll-to-roll waxing machines for over 30 years. Our experience will help you solve your waxing, and coating problems.

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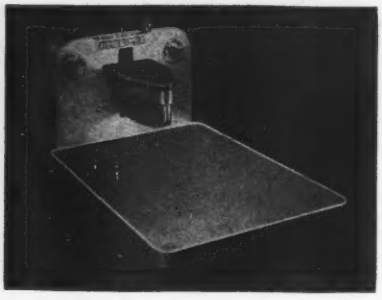
EQUIPMENT AND SUPPLY NEWS

C. F. Hubbs Produces Cell-O-Sealer

Charles F. Hubbs & Company, 389 Lafayette St., New York 3, N. Y., announce that their Food Packaging Division has developed the Cell-O-Sealer, a patentable device for sealing packages hand-wrapped in cellophane.

The designer, W. H. Arthur, Manager of the Food Packaging Division, claims the Cell-O-Sealer minimizes the motions necessary to seal most hand-wrapped packages, and that increased speeds up to 100% are possible over present hand-sealing methods on many types of packages.

The sealer is adjustable to a wide range of style and size packages, and is adaptable into most industries where handwrapping is a problem.



Cell-O-Sealer

Joy Co. Markets "Axivane" Fans

The Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pennsylvania, has developed a new and complete line of "AXIVANE" adjustable-blade fans, Series 1000, for all heating, ventilating, and air conditioning requirements in the industrial and commercial markets.

The Joy Series 1000 consists of axial-flow fans of the vaneaxial type designed for a range of pressures up to 9.60 water gauge and volumes up to 100,000 c.f.m. "AXIVANE" fans are available in 124 different models—from various combinations of 15 different housing diameters (18" to 60"), 4 hub sizes, 16 motor-frame sizes, and 4 different speeds. Adjustable-blades, a Joy development, insure great flexibility in performance. A simple, compact design with direct, in-line drive is said to lower installation costs, minimize space requirements and develop maximum volume and pressure per pound of fan-and-motor.

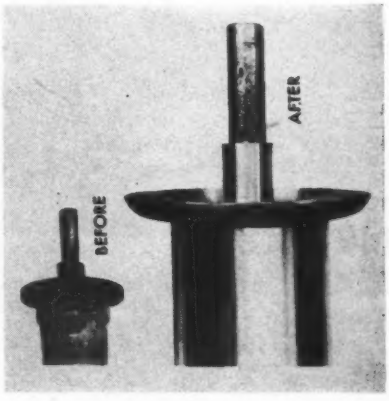
JOHN M. WEST
who has been appointed New York Public Relations Director of Foster Wheeler Corporation.

Rodney Hunt Rebuilds Wornout Rolls

Where the body surfaces of industrial rolls undergo a continual wearing away, they can be salvaged by the Rodney Hunt recovery process at a considerable saving over the cost of new rolls.

Not only rubber-covered rolls but many surfaced with bronze, brass, stainless steel or iron will become worn or badly pitted and scarred. In all such cases they can be reconverted to stainless steel jacketed roll.

In the roll, the rubber jacket was replaced with one of stainless steel, and a stainless steel splash flange and steel hub supplied by the Industrial Roll Division of Rodney Hunt Machine Company of Orange, Mass.



Economy Pump Buys Wartime Addition

HAMILTON, Ohio—Economy Pumps, Inc., has acquired from the War Assets Corporation the war-time addition to its plant, built by the Defense Plant Corporation. The addition was built in 1942 at a cost of $705,000, to house an Economy subsidiary, Liberty Planers, Inc.

The new building contains 100,000 square feet in five parallel crane bays, served by 30, 15, 10, 5 and 3-ton cranes, together with land for future expansion. A Baltimore and Ohio RR switch spur for five cars enters the building.

Equipment in the new plant includes: planers for work up to nine feet wide and 30 to 40 feet long; latest type grinders; horizontal and vertical boring machines; turret and engine type lathes; horizontal and vertical milling machines; Hydrotel and Borematic type machines; large radial drills and a completely equipped tool room with jib borers and tool design department.

The Economy firm manufactures centrifugal, axial flow and mixed flow type pumps in a wide range of sizes up to 150,000 gallons per minute. Test equipment in the plant is capable of performance tests up to 30,000 GPM.

The new plant will house both of Economy's subsidiaries, Liberty Planers, Inc. and the Klipfel Mfg. Co., which produces automatic regulating valves. According to company officials, the total investment runs well into seven figures.

This extension of manufacturing facilities is expected to result in a large increase in the production of Economy Pumps and Klipfel Valves and furnish large flow testing facilities for the Klipfel products.

Hoffman Booklet Explains Design of Blowers

Centrifugal Blowers and Exhausters—New 12-page booklet A-650 describes many applications of Hoffman Multistage Centrifugal Blowers and Exhausters on production operations which require air pressure from one to eight p.s.i. on vacuum from two to 11½ inches of mercury. Design features are explained graphically, and operating characteristics and advantages described. The booklet includes charts showing capacity ranges, and a "Handy Data" page of tables, conversion factors and graphs to aid in determining blower or exhauster requirements. United States Hoffman Machinery Corporation, Air Appliance Division, 105 Fourth Ave., New York 3, N. Y.

400 Attend Dinner At Manhattan Rubber

PASSAIC, N. J.—Four hundred foremen, supervisors, officials and their wives, representing the production management of the Manhattan Rubber Division, Raybestos - Manhattan, Inc., enjoyed a social evening at Donohue's Inn, Mountain View, early this month.

John H. Matthews, vice - president, welcomed the foremen and expressed appreciation for the work of the committee. He paid tribute to Manhattan's retired pioneer foremen, three of whom served the company for fifty years and who were present at the dinner. They were Morris G. Fitts, Andrew J. Gibson and John Dotterweich.

Dennis J. Fenelon, personnel manager, acted as toastmaster. He read a telegram from Charles T. Young, former factory manager, expressing regrets on not being able to attend the dinner and sending best wishes.

Colonel Jack Major delivered a humorous but philosophical talk entitled "Women, Taxes and Pigs" as the speaker of the evening.

The committee in charge consisted of Harry V. Snyder, Emil W. Kazimer, Carl A. Anderson, Dennis J. Fenelon, James J. De Mario, Richard T. Griffith and Nathaniel Finch.

OBITUARY

Dr. Lewis A. Youtz

APPLETON, Wis.—Dr. Lewis Addison Youtz, who joined the staff of the Institute of Paper Chemistry after he retired as chemistry professor at Lawrence College 13 years ago, died suddenly Wednesday afternoon, November 19, at his home. He was 83 years old. Dr. Youtz served on the Institute's staff for five years and did research for a year. He engaged in extensive research in antimony and antimony compounds. He was at Lawrence for 32 years. He was a member of the American Chemical Society, the Wisconsin Academy of Science, the London Chemical Society, and the Society of Chemical Industry.

Last June, Lawrence conferred on him the honorary degree of doctor of science. He was a member of the First Methodist Church here for 45 years and of the official board of the church. Funeral services were conducted November 22.

Fred M. Dorris

BUFFALO, N. Y. — President of the Buffalo Envelope Company, 270 Michigan Ave., from 1919 until his retirement in 1937, Fred McBride Dorris, 73, of Woodward Rd., Elma, died recently after a six-month illness. Dr. Dorris was born in Dansville, but came to Buffalo as a child. He attended School 10 and old Central High School. He lived in Buffalo until moving to Elma in 1934.

His first employment was at Lockwood & Oliver, now known as Millington Lockwood, Inc., stationers, where he remained about six years, later going to the R. H. Thompson Paper Company for several years. He began his association with the Buffalo Envelope Company in 1903.

Active in various civic minded clubs, Mr. Dorris was a past president of the Buffalo Athletic Club, the Greater Buffalo Advertising Club and National Association of Envelope Manufacturers. He also was a past director of the Buffalo Automobile Club and a member of Highland Lodge of Masons.

New York Forestry Alumni Set Annual Luncheon Date

TRENTON, N. J.—The annual luncheon and get-together of the New York State College of Forestry Alumni will be held during the TAPPI convention in New York on Wednesday, February 25, 1948, at the Hendrick - Hudson Room of the Hotel Roosevelt. All alumni and their friends are cordially invited to attend. Reservations may be obtained by notifying Lionel M. Sutherland, Sutherland Refiner Corporation, 143 East State Street, Trenton, chairman of the committee for the 1948 luncheon.

PAPER EXPORT

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DIGESTED

No major manufacturing industry has had a final average profit margin as high as ten per cent on sales in any one of the past six years, either before or after inventory adjustment. This would hold true for 13 years past but for three exceptions out of a possible 260.

Covering all 20 industries for 18 years gives 360 figures of which not more than seven figures are ten per cent or higher,—(using either tabulation).

Profit margins under five per cent have predominated the industry by industry profit analysis in recent years. After inventory adjustment, the statistics for 20 industries over the past six years show three profit margins under five per cent for every one over five per cent. (91 out of 120.) (Before inventory adjustment, the result is about two to one.)

In the light of these figures as revealed in the attached tabulations, the impact of manufacturers' profit margins upon prices cannot be very great. In the manufacture of food products the profit margins (after elimination of price changes in book value of inventory) average less than 2½ cents per dollar of sales, yet food is the most pressing problem in the current discussion of prices. — PROFIT MARGINS AND PRICES study of the National Association of Manufacturers.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1947		Corresponding Weeks—1946	
October 11	108.4	October 12	105.9
October 18	108.3	October 19	105.1
October 25	110.2	October 26	106.8
November 1	111.1	November 2	107.2
November 8 (revised)	108.9	November 9	106.8
November 15	*108.0*	November 16	104.9

COMPARATIVE MONTHLY SUMMARIES

1946				1947			
Jan.	94.7	July	94.0	Jan.	102.1	June	106.0
Feb.	98.4	Aug.	104.7	Feb.	105.9	July	93.5
Mar.	104.4	Sep.	101.3	Mar.	106.1	Aug.	104.2
Apr.	102.7	Oct.	106.4	Apr.	105.1	Sep.	102.0
May	100.7	Nov.	105.5	May	106.2	Oct.	109.5
June	104.6	Dec.	97.0				
		Year Avg.	101.1				

COMPARATIVE YEARLY SUMMARIES

	1940	1941	1942	1943	1944	1945	1946	1947
Year to Date	86.1	96.8	91.7	88.4	88.5	89.4	101.3	*104.5*
Year Average	85.6	97.4	90.4	87.8	88.1	89.4	101.1	

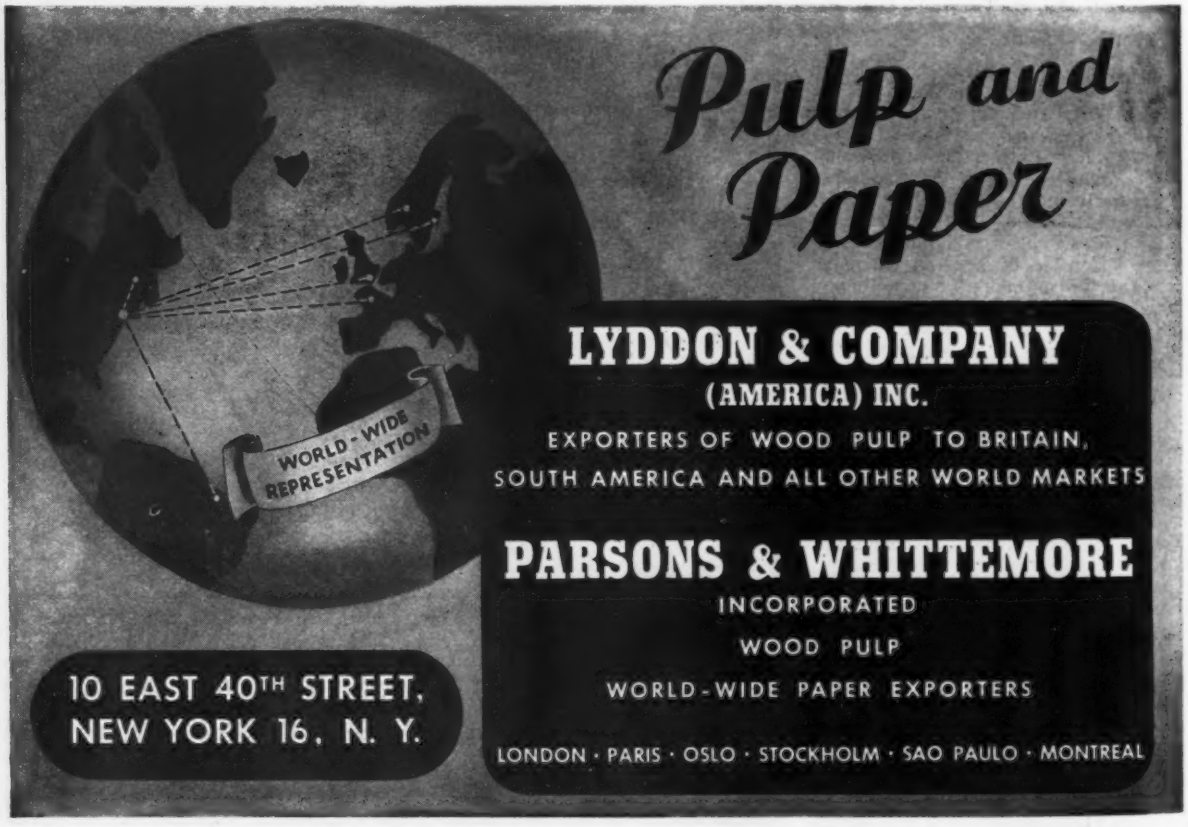
PAPERBOARD OPERATING RATIOS†

Current Weeks—1947		Corresponding Weeks—1946	
October 11	102	October 12	99
October 18	101	October 19	98
October 25	101	October 26	101
November 1	100	November 2	100
November 8	102	November 9	102
November 15	*101*	November 16	101

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1946	90	91	100	99	94	97	89	99	96	100	99	92	96
1947	99	103	101	100	101	101	90	99	96	*101*			

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.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EDITORIAL

New Record in Sight

With ten months of the year passed into the record, and six new monthly high marks established during the course of their passage, the accomplishments of the paper and paperboard industry were summarily reviewed this week and found good. In a review of the year to date, as of the end of October, the American Paper and Pulp Association recounted that production of paper and paperboard for the month reached 1,894,000 tons, and submitted the considered view that this is the result of improving basic factors.

The demand at the mills' level has continued high, according to the review. Raw material supplies have been easing, says the A.P.P.A. since imports of woodpulp have been sustained with Canada well in the lead as a source of woodpulp supply to this country. Canada it is found, has maintained and improved the position it attained during the war when Canadian production took over the pre-war position of Sweden as the principal source for United States imports of wood pulp. In October, imports from Sweden were only 16,000 tons above imports from Finland.

Supplies of pulpwood continue to be adequate for the production requirements of the domestic pulp producers, according to the A.P.P.A. Bad weather in the South during August and September curtailed pulpwood receipts in some areas but inventories were drawn upon and pulp production was maintained at a high level. Waste paper collections have been so organized as to bring in an abundant supply of most grades.

Together with the easing of raw material supply has come the addition of some new capacity to the industry. Some of the new capacity that was planned for operation in 1946 and early 1947 has been delayed, according to the summary, but it would seem that much of this capacity is already being felt in the production figures.

The Association's September index of basic demand moved upward to 171.0 from 167.6 in August while the production index was moving upward more than ten points, from 170.1 to 180.9. This behavior is held to indicate a further easing in the overall supply demand situation. Orders received by the mills were 3.2 per cent below production during October while the backlog of orders decreased two per cent and stocks on hand at the mills increased slightly.

At the end of September overall pulpwood inventories reached a new peak of 4,898,000 cords. The Northeast and Pacific regions reported marked improvement. The Lake States and Southern regions were found to be lower and the Appalachian region remained unchanged from a year ago.

Inventories of woodpulp were further strengthened in September. With inventories at pulp, paper and paperboard mills of 664,000 added to estimated dock stocks of 94,000 tons the total wood pulp inventory available to the industry reached an estimated 758,000 tons, the highest for some years.

Total imports of wood pulp for the first ten months (through October) were 1,929,783 short tons of which 1,259,898 came from Canada and the balance mostly from Europe. Shipments of pulp from Mexico and from Russia amounted to about 6,000 and 5,000 tons respectively.

The daily average production of the papers manufactured by members of the Divisional Associations of the American Paper and Pulp Association increased 9.6 per cent over October of 1946 and 4.3 per cent over September of this year.

The weekly production ratio of the American Paper and Pulp Association and of the National Paperboard Association have continued at high levels during November and there is no reason to doubt that the industry will reach the 21,000,000 ton overall production estimates made previously for the year 1947.

Open House Season

A feature of postwar industrial history that has begun to claim recurrent attention in the news columns is the open house—usually a day set aside on which the families of the working staff, people of the neighborhood, industrial and civic leaders are invited to come in and look around. Usually the occasion is turned into a proper celebration, with something of a mildly gala atmosphere. But with all of the trimmings that the arts of modern hospitality can add to such a function, the basic attraction of tools and work benches is always focal interest point. The laboratory where a daughter works, the machine which a son attends, the shipping room where a neighbor has labored for twenty years—each of these represents the place where a living is made and part of a life is lived. Open house is something more than an invitation to come in and look around; it may also be an extension of the job into the life of the family. Open house can bring the mill into the community.

Credo

There always has been and there always will be a market for a better product. The exponent of this thought is George E. Dyke, president of the Robert Gair Company, Inc., in the closing words of his report, as its president, to the National Paperboard Association, recently in session in New York city. An ideal combination, it would seem, of the visionary and the realistic.

W. L. Cook

Editor

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You'll find plenty of jobs for Ni-Rod. This all-purpose electrode works equally well on either A.C. or D.C. It's available in diameters of 3/32", 1/8", 5/32" and 3/16" from the distributors listed below.

Order a 5-pound package of Ni-Rod for use on all cast iron welding work where strong, sound, machinable welds are essential.

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122 E. 42nd ST., NEW YORK 17, N. Y. *Edited By* R. G. MACDONALD, *Secretary*

Modern Recausticizing Plant Practice*

By Robert F. Clemens[1]

Abstract

The most important factors governing the design and operation of a modern continuous recausticizing plant at a typical kraft pulp mill are discussed. A flowsheet is broken down into its component steps or unit operations and the subject matter is developed under such headings as lime slaking, classification, causticizing, white liquor clarification, lime mud washing, green liquor clarification, and dregs washing.

The paper is well implemented with design data and operating results obtained at several dozen plants of this type built within the last few years. For example, it is recommended that reburned lime be slaked with clarified green liquor for 10 minutes at 200° F.; that all inert material coarser than 65 mesh be classified out; that causticizing time be held to at least 1 hour, preferably 1.5 hours; that 16 sq. ft. of settling area per ton of lime mud be provided in the white liquor clarifiers; and that two stages of lime mud washing be provided in order to insure that the lime mud reburned in the kiln shall contain no more than 0.5% Na_2O.

A portion of the paper deals with the lime and mud filters and the rotary kilns to complete the cycle of the closed recausticizing system. Reference is also made to the correct use of instruments and operating controls. A diagrammatic flowsheet is included showing the solution and soda balances in a typical recausticizing system serving a kraft mill.

In the recovery of soda chemicals from the digester black liquor in kraft pulp mills standard practice is to process this black liquor through evaporators and combustion furnaces to recover these chemicals as a smelt consisting chiefly of sodium carbonate and sulphide. In order to return these chemicals to process in a usable form, it is necessary to convert as much as possible of the sodium carbonate to sodium hydroxide and to deliver the soda chemicals at the desired concentration in an aqueous solution called white liquor. This conversion of the sodium carbonate portion of the smelt to sodium hydroxide is referred to as recausticizing and is represented by the simple chemical equation,

$$CaO + H_2O + Na_2CO_3 \rightleftarrows 2NaOH + CaCO_3.$$

Kraft pulp mill operators are, of course, familiar with the recausticizing process in practice, since it has always been an integral and vital part of the chemical recovery end of a kraft mill.

Functions of a Recausticizing Plant

While it is the primary function of the recausticizing plant to produce a clarified white liquor of the correct soda content, there are other considerations which directly affect the economical aspects of white liquor production. It will be noted from the above equation that in converting sodium carbonate to sodium hydroxide, the relatively insoluble byproduct—calcium carbonate, or lime mud—is produced. In the earlier recausticizing plants, this calcium carbonate was discarded after settling and washing. However, the conversion of this calcium carbonate to calcium oxide by calcination, for reuse in the causticizing reaction, is now almost universally practised in new plants and in many older ones. This lime recovery process involves the washing of the calcium carbonate, followed by filtration and calcination. An incidental, though an essential factor in a properly designed plant is the clarification of the green liquor resulting from the dissolution of the smelt from the recovery furnace. This is necessary since, with a closed lime circuit, insoluble materials in the green liquor would otherwise accumulate in the system.

Therefore, the functions of a recausticizing plant may be summarized as follows:

1. To convert as much of the recovered sodium carbonate to sodium hydroxide as possible.
2. To produce a suitably clarified white liquor of the desired concentration.
3. To separate, wash and dewater the lime mud to prepare it for calcination.
4. To clarify the green liquor prior to recausticizing and to wash the resulting dregs.

Typical Quantitative Flowsheet

It is the object of this paper to describe a modern kraft continuous recausticizing plant and to discuss the more important considerations governing the selection and the operation of the various units ot equipment. The accompanying flowsheet (Fig. 1) outlines the unit operations and indicates quantitatively the flows of liquor and the distribution of soda throughout the system. The flows of liquor are given as cubic feet per ton of pulp, and the distribution of total soda as pounds (Na_2O basis) per ton of air dry pulp.

Several basic relationships between the various

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* Presented at the Annual Meeting of the Technical Association of the Pulp & Paper Industry, Hotel Commodore, New York, N. Y., Feb. 24-27, 1947.

[1] Chemical Engineer, The Dorr Company, New York, N. Y.

flows are evident. For example, the volume of green liquor is 125% of the volume of white liquor, and the volume of wash water is 114% of that of the white liquor. It is evident that the amount of water that can be added to the system is determined by the volume of white liquor produced and by the volume of water which leaves the system with the washed and filtered lime mud and with the washed dregs discharged to waste from the dregs washer. It should also be noted that all of the water added to the system is introduced as wash water so that it can be utilized first to recover soda from the lime mud and green liquor dregs before it is used to dissolve smelt. Any water added in any other way reduces in like volume the amount of water which can be added as a wash, thereby lowering the washing efficiency of the entire system.

The distribution of wash water, as shown in Fig. 1, while subject to some variation from plant to plant, is about the optimum in most cases. Not shown is a small amount of spray water added to the classifier to wash the rejects, consisting of grit and cores. This small amount of spray water just about balances the water that goes into chemical combination in the slaking reaction, plus evaporation losses in the slaker, and, therefore, does not materially affect the water balance in the system.

The distribution of soda, as shown in the flowsheet, indicates that of the total amount of soda leaving the smelt dissolver, about 1.6%, is carried along with the dregs from the green liquor clarifier and 20% is carried along with the lime mud from the white liquor clarifier. The flowsheet also shows that approximately 98% of this soda, entrained with the settled dregs and the lime mud, is recovered by the dregs and lime mud washing steps in the form of weak liquor, which is recirculated for the dissolution of smelt. Thus about 21% of the total soda in the system is continuously recirculated *via* the weak liquors, and only about 1% of the soda entering the recausticizing system is lost.

The soda, as indicated at the various points in the flowsheet, exists chiefly as Na_2CO_3, Na_2S, NaOH, Na_2SO_4 and is reported as total soda expressed as the equivalent Na_2O. It should be understood that after causticizing, the causticizing efficiency (the ratio of NaOH to NaOH plus Na_2CO_3, all as Na_2O) will be approximately 85%, while before causticizing this ratio will be of the order of 18%. The sulfidity (the ratio of Na_2S to total titratable soda, all as Na_2O) is 30% and is, of course, the same before and after causticizing.

Referring again to the flowsheet, the following unit operations will be noted: 1—Lime Slaking, 2—Grit Classification, 3 — Causticizing, 4 — White Liquor Clarification, 5—Lime Mud Washing, 6—Lime Mud Filtration, 7 — Lime Reburning, 8 — Green Liquor Clarification and 9—Dregs Washing. Liquor storage tanks have not been included in the flowsheet, but it is obvious that adequate storage tanks for white liquor, green liquor and weak liquor are requisite to smoothness and continuity of operation of the pulp mill as a whole. The various steps, or unit operations, will now be discussed in the sequence shown in the flowsheet.

1—Lime Slaking

Reburned lime is brought in contact with the green liquor in the slaker and the slaking and recausticizing reaction is started. The slaker should be operated to deliver a slurry of completely slaked lime under conditions which will yield, after causticizing, (1) a calcium carbonate which will settle to a low dilution and (2) a clear white liquor.

The slaking operation can be carried out either (1) by contacting the lime with all of the green liquor or (2) the green liquor can be split, so that the lime is slaked in one portion and the remaining portion is added to the classifier. Considerable study has been given to the effect of this ratio of green liquor to lime in the slaking step on the settling properties of the resulting lime mud. The evidence, based on plant scale observations and laboratory tests, is that the settling characteristics of the lime mud are essentially the same, regardless of whether the lime is slaked in all of the green liquor, which gives a liquor to lime ratio of about 15:1 water basis, or whether it is slaked with a liquor to lime ratio as low as 4:1. With most limes, slaking ratios of 4:1 or less yield a very high consistency slurry which presents many processing difficulties and requires much operating attention. Also at very low slaking ratios, the reaction is naturally very violent and the operation would naturally be difficult to control.

Broadly, it is desirable to maintain the liquor to lime ratio as low as possible, consistent with smooth operation. This keeps the volume being put through the slaker at a minimum. Therefore, for any size of slaker, the lime is given the maximum time to slake completely.

One of the most important variables which affects the slaking operation and the settling properties of the resulting calcium carbonate is the quality of the lime. A reasonably fresh, hot, well-burned lime will slake very rapidly and will yield a fast settling mud, requiring less than one-half of the settling area for white liquor clarification as a lime mud produced when using cold, aged reburned lime. Similarly, cold new makeup lime is known to slake more slowly and to yield a slower settling carbonate than hot reburned lime. It is, therefore, obvious that reburned lime should not be stored for long periods before reuse. Furthermore, in order to minimize the effect of the poorer slaking properties of cold makeup lime, it is wise to provide for the continuous blending of the cold makeup lime with the hot reburned lime in the continuous feeder leading to the slaker.

While the lime should be slaked as soon as possible after calcination, from a practical point of view it is desirable to process the lime through a small storage bin and to feed from this bin to the slaker. This permits the required control of the rate of lime addition to the slaker and also permits the lime to be used while still hot. Also this provides a storage cushion, so to speak, between the lime kiln and the slaker.

The lime should be hot before slaking and it is equally important that the green liquor be at least 200° F. to insure rapid and complete slaking. With a green liquor temperature of 200° F. and with fresh hot lime, a detention period in the slaker of 10 minutes will generally insure complete slaking.

Another variable in the slaking operation which has a marked effect on the settling characteristics of the lime mud after causticizing is the amount of excess lime. The excess lime should be kept to a minimum since both the settling and the filtering rates of the lime mud fall off rapidly as the excess lime is increased.

With regard to the design requirements of the

slaker, the agitation should be such as to insure that all of the lime is thoroughly wetted and not permitted to segregate and cake up. Portions of the lime must not be allowed to remain unslaked by the time they leave the slaker. Sufficient agitation can be provided by the revolving drum type of slaker or by the turbine-agitator type slaker. Violent agitation is detrimental, producing slow settling carbonate.

It is obvious that when contacting hot lime with 200° F. green liquor there will be considerable evolution of steam. Therefore, the slaking equipment must be properly ventilated. Where seals are required, special attention must be given to insure a neat installation. Closely tied in the ventilation is the problem of the introduction of lime and liquor. The direct introduction of the lime by means of a screw conveyor is usually most satisfactory regardless of the type of slaker. The screw feeder, a positive feeder, also acts as a vapor seal. Chutes and non-positive types of feeders should be avoided since they invariably plug up with a sticky pastelike deposit.

Lime slaking equipment in a causticizing plant is subject to corrosion. The action of the chemical compounds is coupled with the severe abrasive action of the lime. The equipment should be very rugged; heavy white iron, concrete or refractory liners are required; and agitators should be of stainless steel.

2—Classification

It is necessary to remove the inert matter from the lime, otherwise this inert material builds up in the circuit, gradually lowering the available CaO of the recycled lime to the point where the circuit has to be purged at intervals and a fresh start made with all new lime. In fact, this was exactly what happened in the earlier causticizing plants, where an appreciable percentage of the lime mud was continuously discarded to maintain the lime availability at the proper value. Therefore, as shown in Fig. 1, this classification step is closely tied in with the slaking operation and the slurry from the slaker passes directly to the classifier.

It has been demonstrated that by classifying the slaked lime slurry at about 65-mesh and discarding the coarse fraction, the availability of the lime in the circuit can be maintained at close to 85%. This classification step is carried out in hydraulic classification equipment.

For the classification to be effective, sufficient area must be provided in the classifier to give an upward velocity through the unit of approximately 0.5 ft. per minute, with a slurry concentration of about 10% solids, $CaCO_3$ basis, which is approximately the concentration after all the green liquor has been added. The agitation in the classifier should be limited and controllable. The de-gritted overflow from the classifier should be taken off across a weir to minimize velocity effects.

The means for removing the settled grit should be continuous and mechanically positive. Methods which depend on the grit rolling or sliding will invite trouble.

Adequate drainage of the grit before it is discharged from the classifier, is of course desirable so as to minimize the loss of soda and to facilitate disposal. A small quantity of wash water is usually applied as a spray before final drainage of the grit to wash back and recover fine entrained lime and strong soda liquor. All classifier parts should be of extra heavy construction or stainless steel.

3—Causticizing

Up to 65% of the causticizing reaction is completed in the slaking and classification step, but considerably more detention time must be provided before this reaction reaches equilibrium. The reaction rate falls off rapidly as equilibrium is approached. It is, therefore, customary to pass the partially causticized slurry from the classifier through three agitator-equipped tanks in series, called causticizers, and in which a minimum detention of 1 hour, but preferably 1.5 hours, is provided. Three tanks are specified to minimize short circuiting and to afford protection in case of enforced shut-down of one. A causticizing efficiency (the ratio of NaOH to NaOH plus Na_2CO_3, all as Na_2O) of between 80 to 85% is usually obtained and this is a good practical range. Attempts to get higher efficiencies usually are not justified, since longer causticizing periods or a great excess of lime, or both, are required to obtain comparatively small increases.

The agitators should be of stainless steel and the tanks should be acidproof brick or concrete lined.

4—White Liquor Clarification

The slurry from the causticizers is now ready for clarification, to yield a white liquor suitable for use in the digesters, and a thickened lime mud, ready for washing to recover soda, and for reburning.

The first consideration in the determination of white liquor clarification equipment is that of the required settling area. The basic design figure used to determine this settling area is the so-called "unit area," expressed as square feet of settling area per ton of lime mud (dry) per day. Tests in the field indicate a wide range of unit areas, ranging from about 8 sq. ft. per ton of lime mud per day to over 20 sq. ft., depending largely on the quality of lime being used.

For new plant design a figure of 16 sq. ft. per ton of lime mud per day is usually used. This is a conservative figure, but it is justified since it gives sufficient area to tide over those periods when the settling properties of the lime mud are impaired due to poor lime, to over liming, or to other departures from the normal. Also this basis of establishing settling areas assures an overflow of maximum clarity.

This unit area figure is related to concentration of solids in the underflow. The usual "16 sq. ft. basis" is based on an underflow of 40% solids. If an underflow figure of 30% solids is used, the required unit area falls off considerably. However, on causticizing work an underflow as heavy as possible is sought in order to reduce the soda carried along with the lime mud. In the laboratory, lime muds will settle to 45 to 50% solids. In plant practice, 33 to 40% solids are usually satisfactory.

Occasionally, plants are reported as operating with extremely low unit areas, sometimes in the neighborhood of 10 sq. ft. per ton. Usually the explanation is that the underflows are thin and the overflows turbid. In a few isolated cases, where the lime quality is consistently high and the control of lime addition exceptionally good, low unit areas are possible. However, it is extremely risky to design on this unusual basis.

With the lime mud tonnage known and the unit area basis decided upon, the required settling area for white liquor clarification can be readily calculated. With this total area established, a decision can be made as to the number of compartments to specify for a tray

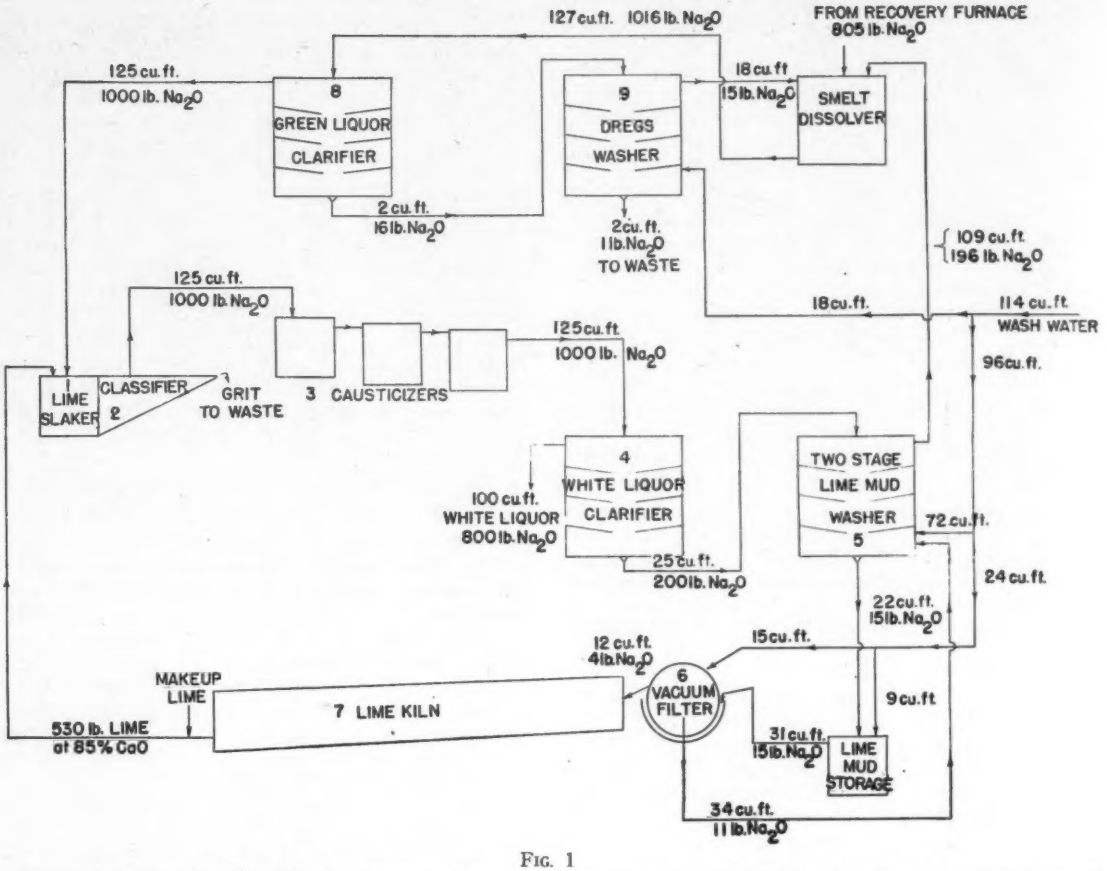

FIG. 1

Kraft Recausticizing Plant—Process Quantity Flowsheet. All quantities are expressed as cubic feet or pounds per ton of air dry pulp.
Basis: 100 Cu. Ft. White Liquor Per Ton Pulp
8.0 Lb. Total Alkali as Na_2O Per Cu. Ft.
7.0 Lb. Active Alkali as Na_2O Per Cu. Ft.
30% Sulphidity
White Liquor Clarifier Underflow 33% Solids
Lime Mud Washer Underflow 40% Solids,
Filter Cake 55% Solids
900 Lb. of Lime Mud (Dry) Per Ton of Pulp Handled in Steps of 1 to 6 Incl.
15 Lb. of Dregs Per Ton of Pulp Handled in Steps 8 and 9
Soda Reported Is Total Soda as Na_2O
Volumes Reported Are Liquor Volumes Without Suspended Solids

thickener, or, if the area is very small, a choice can be made on whether to use a unit thickener or a tray thickener. In almost all cases a tray thickener is indicated, to save floor space and reduce heat losses. The area of the tray thickener to be specified is equal to the total settling area required, divided by the number of compartments. The compartments are arranged to operate in parallel. For example: for a 220-ton pulp mill, the lime mud tonnage will be about 100 tons per day. Based on a design unit area of 16 sq. ft. per ton of lime mud per day, the required settling area is 1,600 sq. ft. Using a four-compartment tray thickener, the required area per compartment is 400 sq. ft. or a 23-foot diameter unit. Using a three-compartment tray thickener, the required area is 533 sq. ft. or a 26-foot diameter unit.

The depth of each tray thickener compartment is important. Excessively deep compartments are of no benefit, but there are certain minimum requirements which should be met. It is true that as little as 3 feet of depth is sufficient for clarification. However, once the solids have settled to a consolidated pulp, sufficient additional depth must be provided to give the lime mud pulp enough detention time to reach maximum density. At least 2 feet and preferably 3 feet should be allowed for this sludge thickening. Therefore, the depth of each compartment should be at least 5 feet to permit the continuous discharge of mud at maximum final density.

For maximum efficiency in a tray thickener, it is of course desirable that each compartment handle its proportionate share of the settling load. The net result will be the same as using a number of separate unit thickeners equal to the number of compartments in the tray unit. Therefore, the tray thickener design should provide for the equal division of the feed to each compartment and the withdrawal of the corresponding equivalent overflow from each compartment. The settled sludge should be concentrated to maximum final density before being pumped from the unit. Positive mechanical action to rake the settled sludge to the point of discharge is imperative. Without positive raking, a low concentration of solids in the discharge will result.

Considerable corrosion is encountered in white liquor clarification equipment. Adequate protection must be provided. The feed and overflow boxes

should be of stainless steel or at least be concrete-lined, especially the feed box, because of the combined action of the white liquor, the abrasive action of the calcium carbonate, and exposure of the feed to aeration. Stainless steel boxes are excellent but add very materially to the cost. The other points of corrosion are the trays, internal boots, etc. Some users are standardizing on ⅜-inch plate for these parts, although the more usual standard is ¼ inch. The thickener tank should be of at least ½-inch plate on the sides and bottom.

While overloads resulting from an excessive accumulation of solids in the thickener are not common, motorized and hydraulic lifting devices now permit the rakes to be readily raised and lowered with a minimum of operating effort. This permits an operator to work out an occasional overload with relative ease, and also facilitates shutting down and starting up operations.

An instrument for continuously recording the load on the thickener raking mechanism is of great assistance in operating, and gives a daily record on all shifts. This instrument should be included on every white liquor clarifier installation.

5—Lime Mud Washing

While the white liquor clarifier carries out the important function of delivering an overflow of well clarified white liquor ready for use in the digesters, it also delivers an underflow of thickened lime mud containing an appreciable quantity of soda. Therefore, the underflow from the white liquor clarifier is next processed in the lime mud washer, the function of which is to recover as much of the soda as possible and return it as weak liquor for eventual use in the smelt dissolver.

In Fig. 1, a white liquor clarifier underflow, containing 33% solids, is indicated. This underflow will contain 200 pounds of soda per ton of pulp and 900 pounds of lime mud. Therefore, the lime mud contains 22.2% soda on a dry lime mud basis. If the underflow from the white liquor clarifier is pumped at a concentration lower than 33% solids, the soda will, of course, be correspondingly higher. Obviously the solids content of the white liquor clarifier should be as high as possible to reduce the amount of soda that must be recovered by washing.

Most installations in the past washed the lime mud from the white liquor clarifier by giving it a single stage of dilution washing, using fresh wash water and filtrate. The practice is to dilute the underflow from the white liquor clarifier back to about 11% solids and then to settle it again to about 40% solids. This is carried out in a thickener practically identical with the white liquor clarifier. This single stage of dilution washing effects a reduction of soda content to about 20% of what it was in the underflow of the white liquor clarifier. The lime mud is then filtered and delivered as a filter cake of 55 to 60% solids to the lime kiln. Some spray wash water is applied on the filter. The soda content of the lime mud going to the kiln following this procedure will run about 1.5% as Na_2O. In some installations it is appreciably higher.

The soda content of the lime mud going to the kiln has a marked effect on the life of the kiln lining and on the operation of both the filter and the lime kiln. It has been well recognized by operators that maintenance and operating advantages would result if the soda content of the lime mud could be reduced below this figure, preferably below 1%. If the soda content of the lime mud to the kiln gets much below 0.5% there are reports that dusting problems arise in the kiln.

Therefore, the modern recausticizing plant provides for two stages of lime mud washing by subjecting the lime mud to two successive decantations, using fresh water and filtrate for the second stage and the overflow from the second stage as dilution water in the first stage. The overflow from the first stage contains the recovered soda and goes to weak liquor storage. The settled solids from the second stage are filtered before calcination just as in the single stage washing arrangement. The material balance flowsheet accompanying this article is based on two stages of lime and washing.

The use of two stages of lime mud washing, followed by vacuum filtration, will easily reduce the soda content of the lime mud going to the kiln to 0.5% as water soluble Na_2O. This will result in improved filter performance and increased life of kiln lining. However, there is another very important advantage of two stages of lime mud washing in that the lime mud, prior to filtration, is low enough in soda to be fed directly into the kiln during an emergency when a filter is out of service. Thus a spare filter is not a necessity.

The two stages of lime mud washing can be carried out in a single tray thickener, rather than in two units, and this is preferred. The two-stage lime mud washer should be of a flexible design so as to permit its being operated as a white liquor clarifier in an emergency. Actually the settling area requirements for each stage of lime mud washing is about one-half of the total area requirements of the white liquor clarifier, so that the two stages of mud washing provide sufficient area to take care of the white liquor, when necessary.

Corrosion in the lime mud washer is not severe, but usually the same plate thickness is specified as for the white liquor clarifier, but stainless steel boxes are not used.

6—Lime Mud Filtration

The lime mud, after being washed in sedimentation equipment, is diluted in a lime mud storage tank and then dewatered on a vacuum filter. This filtration step reduces the moisture in the lime mud fed to the lime kiln, thus effecting fuel economies, and also reducing the soda content, due both to the dewatering process and to the displacement washing with shower water.

The most satisfactory type of filtration equipment for this service is the rotary drum type of filter. Materials of construction are important. The drum shell should be of cast iron with a removable cast iron screen held in place with No. 302 stainless steel screws. Division strips should be replaceable and of No. 302 stainless steel. A suitable filter cloth is a 20 × 250-mesh No. 304 stainless steel wire. The cover winding should consist of No. 316 stainless steel bands. The discharge scraper should be faced with a stainless steel blade.

The usual design basis for calculating the filter size is 1 to 1.5 tons of lime mud (dry) per day per square foot of filter surface.

7—Lime Reburning

The dewatered lime mud is fed to a continuous rotary lime kiln in which the calcium carbonate is

converted to lime for reuse. No attempt to cover the subject of lime reburning will be made in this paper since obviously this is a major subject in itself. However, it should be mentioned that there are new developments in this field, the most interesting of which is the trend to longer kilns than have been used heretofore in pulp mill recausticizing plants. Claims are now made for fuel consumptions in the order of 8 to 10 million B.t.u. per ton of lime which contrasts with the figures of between 12 and 15 million B.t.u. per ton in most installations in the past. This reduction in fuel consumption means appreciable dollar savings.

Another development of interest is the use of limestone as a source of new lime makeup. It has been demonstrated that it is feasible to add limestone directly to the kiln to satisfy the lime makeup requirements. Whether or not this procedure should be followed depends on local conditions, including the relative cost at the site of new lime and limestone and the reburning costs.

8—Green Liquor Clarification

Reference to Fig. 1 will show that the weak liquors from the lime mud and dregs washers, after being returned to the smelt dissolver, are built up in soda content by dissolving the smelt. This weak liquor, after passing through the smelt dissolver, is called green liquor. This green liquor will contain small amounts of suspended solids, consisting chiefly of carbon, refractory material and iron compounds. In modern recovery boiler practice, these solids will average about 10 to 15 pounds per ton of pulp. It is necessary to remove these solids as they will be trapped with the lime mud and build up in the lime circuit, causing a progressive drop in the lime availability.

Therefore, the green liquor is clarified by sedimentation in a tray thickener similar to the white liquor clarifier in design but no special protection against corrosion is required, except that the plate should be the same thickness as that in the white liquor unit. Usually the area requirements of the green liquor clarifier will be the same as the white liquor clarifier or slightly less.

9—Dregs Washing

The settled solids from the green liquor clarifier will average about 10% solids which, based on 15 pounds of dregs per ton of pulp, means that about 16 pounds of soda, as Na_2O, per ton of pulp is entrained with the dregs. This corresponds to 37 pounds of salt cake per ton of pulp which in a 200-ton mill is almost 4 tons of salt cake per day. While this is a very small percentage of the total soda in the system, it obviously would represent a serious loss if discarded and, therefore, the recovery of this soda is of importance.

The recovery of the soda in the green liquor clarifier underflow is accomplished by giving the dregs three or four stages of counter-current washing in a washing type tray thickener or dregs washer. In this unit the compartments are arranged to operate in series in contrast to the white and green liquor units where the compartments operate in parallel. The solids are processed downward through the unit, being successively reslurried with overflow liquor from the compartment below and allowed to settle. The wash water is processed up through the unit, being first introduced into the bottom compartment and finally flowing from the top compartment to weak liquor storage. Usually between 15 and 20% of the total wash water that can be added to the recausticizing plant is added at the dregs washer. The remainder is used for washing the lime mud.

Because of the small amount of soda involved, frequently just three stages of dregs washing are specified. However, the additional cost of a four-stage washer over a three-stage unit is not great, and the savings in soda will generally pay for the additional stage in about one year. Another consideration which frequently is decisive in favoring the four-stage unit over the three-stage unit is that the additional depth of the four-stage unit may permit gravity flow of the overflow to the weak liquor storage tank which is not practicable with a three-stage unit.

Corrosion in the dregs washer is not severe and no special construction is required.

Instrumentation

As in other phases of process work, control instruments are finding increased applications to facilitate recausticizing plant operation. The modern plant frequently includes the following instruments: wash water flow recorder-controller, wash water temperature recorder to first causticizer, white liquor flow green liquor temperature recorder-controller, temperature recorder to first causticizer, white liquor flow recorder, storage tank level indicators, and torque recorders on the white liquor clarifier and lime mud washer.

The importance of the above instruments to assist in the operation of a recausticizing plant can be readily appreciated by operators and, in most cases, the value of each instrument is obvious. However, the special value of the wash water flow recorder-controller should be noted. Reference to the flowsheet will show that the key control is the volume of water introduced into the system. With instrumentation to maintain this flow at its correct value or to adjust it readily to compensate for other process variations, the entire causticizing balance is maintained which, of course, is of prime importance in controlling the system. Operators are familiar with the complications resulting from an accumulation of excessive weak liquor, resulting from the introduction of too much wash water.

This paper has been, of necessity, limited to the conventional continuous recausticizing process for kraft mills. However, there are several variations to the standard continuous flowsheet which are of interest. In some of the smaller plants lime mud filters are not used and the lime mud is given three or four stages of counter-current washing in a series type of washing tray thickener to reduce the soda to the point where the lime mud underflow from this thickener can be fed directly to the lime kiln. Frequently this results in the use of so-called combination tray thickeners, consisting of up to six compartments. The top one or two compartments are used for white liquor clarification and the lower compartments for lime mud washing. Also the green liquor clarification and dregs washing steps are usually handled in a similar combination machine in this type of plant.

There are some installations where the lime mud washing is handled by several stages of filtration. In most of these instances this is necessitated by the fact

that the recovery system does not completely reduce the black ash. This requires a black ash leaching procedure which results in a limited quantity of wash water being available for lime mud washing and, therefore, several stages of filtration are used to accomplish the required washing. However, these plants where black ash leaching is practiced are largely soda mills.

Conclusion

The type of continuous recausticizing plant discussed in this paper has been in a process of continuous evolution and betterment for more than 20 years. Since 1943, some thirty odd kraft pulp mills, with an aggregate daily capacity of about 7,500 tons of pulp have adopted this system, either in the form of entirely new construction or as a modernization of existing and less efficient facilities.

Experience has shown that such a system is not only more efficient and economical than the old-time batch system, but more important still, is far easier to operate and keep in balance. Less operating time and supervision is diverted to the secondary operation of recausticizing; more time and energy is concentrated on the primary operation—pulp making.

Three advantages attending the use of the system are basic in that they have a carry-over value into other steps in the pulp making cycle. These are:

1. A uniformly clear and strong white liquor—This makes it easier to control and operate the digesters and results in the more uniform production of a pulp with the desired qualities.

2. A uniformly well-washed lime mud—This improves filter and kiln operation; increases the overall recovery of soda; and greatly lengthens the life of the kiln linings which are injuriously affected by soda solution.

3. A uniformly, well-washed green liquor dregs—This also reduces the total soda loss.

Considering the recausticizing system as, in essence, a chemical reclaiming system, it may be said with confidence that one such as herein described will lose not more than 5 of the 805 pounds of Na_2O nor more than 25 to 50 of the 530 pounds of lime used in the system per ton of air-dry pulp product. Thus the efficiency of chemical reclaiming is of the order of 99+% on soda and of the order of 90 to 95% on lime. Furthermore, the 5 to 10% lime loss is not attributable entirely to the recausticizing system but largely to unavoidable stack losses at the reburning kiln.

Kalamazoo TAPPI Will Discuss Optical Properties

The TAPPI Kalamazoo Valley Section will meet at the Columbia Hotel, Kalamazoo, Mich., on December 11, 1947 at 6:30 p.m. J. A. van den Akker of the Institute of Paper Chemistry will discuss the optical properties, such as brightness and gloss of board and paper. This meeting is the annual paper coating meeting of the Section. There will be a panel discussion with O. W. Callighan of Edgar Bros. Co., W. A. Kirkpatrick of the Allied Paper Mills, and E. G. Milham of the Watervliet Paper Company constituting the panel. The program will be in charge of Victor Burstein of the Michigan Paper Company, Plainwell, Mich.

TAPPI Notes

John S. Barton, formerly of the Institute of Paper Chemistry, is now in the Central Technical Dept., Crown Zellerbach Corporation, Camas, Wash.

John W. Close is now chief chemist of the United Wallpaper, Inc., Aurora, Ill.

Paul R. Wiley is now director of the development department, West Virginia Pulp & Paper Company, Charleston, S. C.

Carl E. Geijer, formerly of the Taggart Corporation, is now chemical engineer for the Union Bag & Paper Corporation, Savannah, Ga.

George E. Chamberlin, formerly of the Institute of Paper Chemistry, is now chemist for the Badger Paper Mills, Inc., Peshtigo, Wis.

John E. Turk, formerly of the Institute of Paper Chemistry, is now packaging research engineer, Glass Container Manufacturers Institute, Butler, Pa.

Ferri Casciani is now director of research for the Niagara Alkali Company, Niagara Falls, N. Y.

Air Conditioning

The Chemical Publishing Company has recently issued "Air Conditioning" by Herbert Herkimer and Harold Herkimer, consulting engineers. (692 pp. 5½ x 8¾). Herbert Herkimer was past director of the Herkimer Institute of Mechanical Trades. The subject matter is selected to give a systematic training to students of air coiditioning engineering and to help engineers and other technical men to solve their problems in designing and repairing equipment, selecting materials and estimating costs. The book is illustrated and contains the solution of many problems.

Among the subjects covered are: gas laws, heat transfer, heat transmission of building materials, radiant heating, elementary thermodynamics and steam, elements of health and comfort, fans, ducts and air distribution, heating load, dehumidification and humidification with air washers, spray system and cooling towers, drying, cooling methods and refrigeration, unit air conditioners, industrial aplications, cost estimation, automatic controls.

Copies may be obtained from the Booke Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York 17, N. Y. at $12.00 per copy.

Process Industries Calculations

The McGraw-Hill Book Company has recently issued another volume in its Chemical Engineering Series, "A Manual for Process Engineering Calculations," by Loyal Clark, chemical engineer for the Celanese Corporation of America (438 pp. 6 x 9).

This is a practical summary of data to aid engineers in more simply performing calculations in the development of chemical processes—from the research report stage up to the final design.

Among the subjects covered are: conversion tables, physical and mechanical properties, thermodynamic data, piping, hydraulics and flow data, heat transfer, combustion, power, pumps, fans, blowers, compressors, absorption, stripping, distillation and water.

Data is given for the pulp and paper operators although in general the author holds to the fundamentals that apply to chemical engineering in all of its applications to any process industry.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York 17, N. Y. at $6.00 per copy.

Production of Fodder Yeast*

By Elwin E. Harris[1], Martha L. Hannan[2] and Ralph R. Marquardt[3]

Abstract

Sulphite waste liquor may be the source of carbohydrates upon which to produce a food yeast for either humans or animals. Sulphur dioxide is removed by steam stripping or by precipitation with lime. The resulting solutions are neutralized to a pH of 4 to 4.5, nutrients added, and then inoculated with a yeast of the Torula *type. Sulphite waste liquor is sterile and therefore suitable for continuous propagation of yeast. One of the most serious problems is the tendency of excessive foaming. This may be overcome by the use of a mechanical device which allows the gas bubbles to break as the liquid falls down a central draft tube.*

Four kinds of liquor were used to propagate yeast — sulphite waste liquor which had been steam stripped to remove the sulphur dioxide, neutralized to pH 4.1 with lime, and filtered; sulphite waste liquor neutralized directly with lime to 4.1 and filtered; liquor which had been concentrated to 40% total solids; and magnesia-base sulphite waste liquor. The rates of growth in these liquors have been compared with the rate of growth in sugar solutions produced by the hydrolysis of wood.

The production of fodder yeast from wood sugars is of interest to the paper-pulp producer for two reasons; first, it provides a rapid means of utilizing the sugars in sulphite-waste pulping liquor and, secondly, it provides a means of reducing the biochemical oxygen demand for such liquors. If this yeast can be produced at a price low enough to compete with agricultural products, it may be used as a protein food for farm animals. With some promotion it is possible that the yeast may become a part of the diet for humans. This paper presents a process developed at the Forest Products Laboratory for the production of fodder yeast from wood sugars.

Many studies have been made on the nutritional value of yeast as a food *(1, 2, 3)*, and it appears that yeast could be a valuable addition to the sources of proteins in the human diet. In addition, yeast is a rich source of natural vitamins, which increase its value. For a number of years baker's yeast and the yeast that is a byproduct of the brewing industry have supplied some human nutrient requirements. Recently laboratory and pilot-plant experiments *(4, 5, 6, 7)* have shown the possibility of producing a food yeast from many of the sources of waste carbohydrates, because yeast may be grown on very dilute solutions and then separated from these solutions by the use of a yeast separator. A commercial plant is now being constructed at Rhinelander, Wis., to produce yeast from sulphite waste liquor.

The need for protein food in Germany from 1932 to 1945 resulted in the construction of several plants for the production of food yeast from sulphite waste liquor, wood waste, prehydrolyzates from pulping, whey, starch factory waste, and other sources *(8, 9)*. The production from sulphite waste liquor in 1944 was about 7,500 tons per year, and at the end of the war plants were under construction that would produce an additional 6,000 tons. Production from wood waste was about 9,000 tons per year.

In Germany the process for production of yeast from sulphite waste liquor consisted of neutralizing the waste liquor with milk of lime to a pH of 4 to 4.5, allowing the precipitate to settle out, decanting, adding nutrients, feeding continuously into a fermentor containing yeast where air was introduced in such a manner as to provide maximum contact with the medium, removing the yeast from the spent liquor, which is withdrawn continuously, defoaming, separating to remove the yeast. and then drying the yeast. Sugar solutions containing as low as 0.5% sugars were considered suitable materials upon which to grow yeast.

Problems connected with the growing of yeast include the cost of the sugar or the cost of preparing the sugar for growing yeast, foaming problems, which involve the use of antifoam, air requirement, cost of nutrients, and cost of equipment.

In many cases it is assumed that, because the sugars are constituents of a waste product, they have no cost. This, however, does not follow. Sulphite waste pulping liquor, for example, contains large amounts of sulphur dioxide, which not only is toxic to yeast growth but also makes the solution too acid. Formic acid, furfural, and wood oils, such as cymene, are present in limited amounts. The sulphur dioxide and other volatile products may be removed by steam stripping, or by neutralizing with lime and blowing air into the neutralization vessel. The most satisfactory method is by steam stripping, because by that means the sulphur dioxide is removed from the solution, and the lime required to neutralize the acid produced by the oxidation of the sulphur dioxide during pulping is relatively small. The equipment in which to conduct this steam stripping must be constructed of acid-resistant material and is, therefore, high in cost. The steam required for this step in the process is also an appreciable item, even if the recovered sulphur dioxide can be reused.

Following the steam stripping, the solution is neutralized with lime and filtered to remove calcium sulphate and any pulp fibers that may be present in the waste liquor. If it is desired to use the German procedure, lime is added to the acid waste liquor, precipitating both the sulphites and sulphates; then air is introduced to agitate the mixture and to remove some of the inhibiting volatile materials present, and the solution is filtered. In either case the cost of these operations must be considered as the cost of the sugar. The more wash water included with the waste liquor, the greater will be the cost, because more steam will be required to do the stripping and more power for pumping and filtering.

In the usual yeast propagator, foaming is a serious problem when growing yeast on sulphite liquor. To overcome this, it is necessary to use antifoam or to devise means of overcoming foaming mechanically. The use of antifoam may be satisfactory in the production of baker's yeast from sulphite waste liquor

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[3] Chemist, Forest Products Laboratory,[4] Forest Service, U. S. Department of Agriculture.
[4] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

where the yeast has a relatively high market value, but the cost of this method is considered prohibitive in the production of food yeast. Fermentors designed to overcome foaming mechanically are more expensive to construct and require more power than the conventional yeast propagator used for producing baker's yeast. In Germany, three types of equipment (the Waldhof, the Vogelbush, and the Scholer fermentors) were used to grow yeast *(10, 11, 12)*. Of these three, the Waldhof appeared to be the most satisfactory, since its operation was continuous, efficient use of air was obtained, and no antifoam was required.

Fermenter

A laboratory-scale fermentor with 34 liters capacity, embodying several modifications of the German Waldhof fermentor *(13)* was constructed for use in the study of yeast production from wood sugars at the Forest Products Laboratory, Madison, Wis. This fermentor is shown in Figs. 1 and 2. In order to withstand corrosion and be easily cleaned, the entire assembly should be constructed of stainless steel. The sugar liquor with nutrients is fed by a proportioning pump continuously into the top next to the aeration wheel shaft and distributed by a disk on the shaft just above the liquid in order to obtain uniform distribution. Overflow spent liquor and yeast passes out through a standpipe that controls the level in the fermentor. Air is introduced through the hollow shaft of the rotating aeration wheel and delivered to the liquid from six tubes outside a central draft tube. The aeration wheel also forces the liquid out of the draft tube and up the outside so that gases may be liberated as the liquid falls down the draft tube.

Cooling is accomplished by circulating cold water through a tube in the liquor. The temperature is controlled by a bimetallic thermoswitch, which operates two heaters on the outside of the fermentor. The pH is measured and controlled by an indicating controller, which is arranged to add a saturated solution of sodium carbonate if the pH is low.

Sugar Solutions Used for Yeast Production

Wood sugars from five different sources were used for the production of yeast. Wood-hydrolyzate sugars were produced by the hydrolysis of Douglas fir wood waste in the pilot-plant operations at the Forest Products Laboratory *(14)*. These wood hydrolyzates contained 4.6% reducing material calculated as glucose. This value included about 0.3% of reducing material that was not sugar. A sample of sulphite waste liquor was obtained from a commercial pulp plant that was pulping principally spruce. The sample was taken directly from the blowpit, neutralized with lime, and filtered to remove precipitated material. A second sample of sulphite waste liquor from a commercial pulp mill pulping a mixture of softwoods was steam stripped to remove sulphur dioxide and other volatiles and then neutralized to pH 4 with lime and filtered. A third sample of commercial sulphite waste liquor was evaporated to 40% total solids and then neutralized to pH 4 with lime. The fifth source of wood sugar was produced in pilot-plant operations, using magnesia-base sulphite pulping liquor.

TABLE I.—EXPERIMENTAL CONDITIONS FOR GROWING YEAST

Equipment:	Single open tank with 34-liter capacity to top of overflow tube.
Circulation:	Motor-driven spinner which draws liquid down a draft tube and forces it up the outside. Spinner is 6 inches in diameter; speed, 1,000 r.p.m.
Air supply:	Air introduced through the spinner at a rate of 1 cubic foot per cubic foot of media per minute.
Method of feed:	Motor-driven proportioning pump; continuous introduction.
Initial pH of feed:	4.1 to 4.2.
Operating pH:	Of fermentor, 5.3, controlled by pH controller.
Temperature:	30° to 32° C.
Operating capacity of tank:	11 to 12 liters.
Temperature control:	Cooling coil in tank. Electric heater on outside of tank with bimetallic temperature controller.

TABLE II.—CONTINUOUS PROPAGATION OF *TORULA UTILIS*[1]

Series No.	Rate of Feed per Hour, liters	Air per Pound of Dry Yeast, cubic feet	Reducing Material Used, %	Yield of Dry Yeast on Sugar Used, %	Protein Content of Yeast, %
Wood Hydrolyzate (Sugar Content, 4.6%)					
10	2.0	630	92.0	39.0	51.3
14	3.0	295	93.8	49.7	57.5
15	4.0	210	93.4	52.6	56.2
16	4.5	212	93.2	46.5	55.4
17	5.0	203	91.1	43.4	51.5
Sulphite Waste Liquor from Blow Pit Neutralized with Lime (Sugar Content, 1.66%)					
21	2.0	1,040	79.0	49.5	51.6
22	3.0	695	78.0	49.0	51.5
23	4.0	540	75.0	50.0	51.0
24	5.0	550	59.0	50.2	50.0
Sulphite Waste Liquor, Steam Stripped, Neutralized with Lime (Sugar Content, 2.56%)					
748	2	890	77.0	49.5	42.6
752	2	850	74.3	52.0	43.2
765	3	850	75.0	46.1	43.6
770	3	850	73.9	47.4	51.4
Evaporated Sulphite Waste Liquor, Neutralized with Lime (Sugar Content, 12%)					
783	3	...	68.8	15.4	...
784	3	...	51.8	8.2	...
Evaporated Sulphite Waste Liquor Diluted 1:1 with Water (Sugar Content, 6.0%)					
789	2	720	75.0	36.0	43.6
792	2	640	77.6	38.1	...
778	3	505	75.9	32.6	...
781	3	500	72.6	34.3	37.5
Magnesia-base Sulphite Waste Liquor (Sugar Content, 2.5%)					
L-1	2	1,150	75.4	52.5	...
L-6	4	645	71.5	49.0	...

[1] Values are averages of a series of experiments.

Methods of Sampling and Analysis

Reducing-sugar Contents

The reducing-sugar content, calculated as glucose, of the wood hydrolyzate before and after yeast propagation was determined by the Schaffer and Somogyi method *(15, 16)*.

Actual sugar content was determined by subjecting the solution to the action of yeast with aeration until the solution would no longer give a test for sugars by the osazone test. In a solution containing a 5.0% reducing material calculated as glucose, 0.3% reducing material was present that did not give sugar tests.

The sugar content of sulphite waste liquor is very difficult to determine because of the large amount of nonsugar organic and inorganic material present. It was found that evaporation to half volume on a steam bath and then diluting back to the original volume removed certain substances that interferred with the sugar determination. It is evident that many nonsugar reducing substances are present because yeast that is capable of almost quantitative removal of sugars did not utilize more than 80% of the reducing substances calculated as glucose.

Yeast

Yeast was determined by centrifuging a representative 10-ml. sample of the yeast and spent liquor overflowing from the fermentor, decanting off the supernatant liquor, washing twice, then centrifuging and removing the wash liquor by decantation, and finally drying to constant weight at 100° C.

Nitrogen Content of Yeast

Nitrogen content of the yeast was determined on

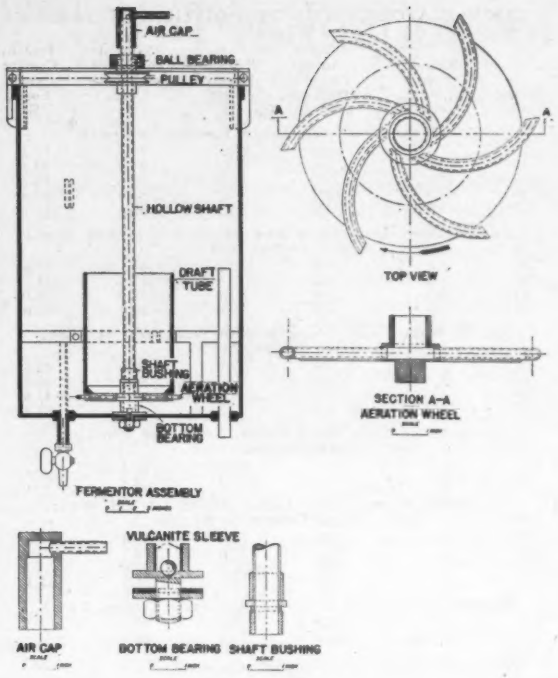

FIG. 1

Laboratory-scale Experimental Fermentor with Mechanical Aerator Built at the Forest Products Laboratory with Design Altered Somewhat from Industrial-Scale Equipment Used in Germany.

the same sample used for yield by adding dilute sulphuric acid to the tube and allowing to stand until the yeast had dissolved, then washing into a Kjeldahl flask and determining nitrogen by the usual Kjeldahl method.

Air used for yeast propagation was washed by bubbling through water and then measured by an ordinary household gas meter.

Preparation of Inoculum

The yeast inoculum was prepared by transferring a small amount of yeast from a glucose malt sprout agar slant to 30 ml. of glucose malt sprout liquid medium in an 8-inch test tube. This culture was shaken and incubated at 30° C. for 24 hours, after which the contents of the tube were placed in a 500-ml. flask with 150 ml. of glucose medium. This culture was then used to inoculate 2 liters of diluted wood-sugar solution for starting the yeast propagator.

The yeast used for this study was a pure strain of *Torula utilis* isolated at the University of Wisconsin and designated as *Torula utilis* No. 3 in its collection.

Starting the Yeast Propagator

The 2 liters of inoculum were placed in the laboratory propagator; aeration and continuous addition of a wood hydrolyzate solution diluted to half concentration was started. The overflow product was centrifuged and the recovered yeast returned to the propagator to hasten the growing of yeast. When yeast was to be grown on wood hydrolyzate, as soon as the product began to overflow the feed was changed to full-strength sugar and introduced at 2 liters per hour until equilibrium conditions resulted, after which the rate was increased. If sulphite waste liquor was to be used, it was fed in as soon as the amount of yeast in the propagator was about 1.5% dry basis, or the amount that would be produced from the growing of yeast on the sugar in the sulphite waste liquor. The rate of feed was adjusted to determine the maximum feed that could be introduced without loss in yield. Table I gives the conditions for yeast growth and Table II the values for production of *Torula utilis* No. 3 yeast by continuous propagation. Protein values were obtained by multiplying the nitrogen content of the yeast by 6.25.

Discussion

The foaming property of wood-sugar solutions, when used for the production of yeast, was controlled by the use of a special type of propagator that kept the foam in a fluid condition. Continuous feed and continuous removal of product resulted in good utilization of the sugars in the solution when the throughput time was 2 to 4 hours. Satisfactory yields and operating conditions were attained with all samples except the sulphite waste liquor that had been evaporated. Since the density and viscosity of this solution was such that it could not be used satistorily in the equipment in full strength, it was diluted. With less than 1 to 1 dilution it was difficult to remove the yeast. Yields of yeast were generally lower than from unevaporated liquor. The black color produced when sulphite waste liquor was evaporated produced a dark-colored yeast that was difficult to clean by washing. Yeast grown on wood hydrolyzate or unevaporated sulphite waste liquor was light in color and easily washed free of extraneous materials. Because of the rise in pH that accompanied the growth of yeast, the feed liquors were maintained at a low pH of 3.9 to 4.1, which aided materially in eliminating contamination and in the ease of control of the process.

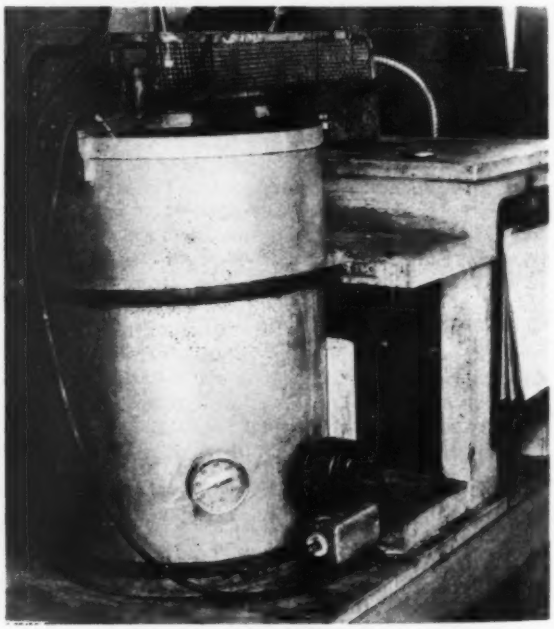

FIG. 2

Temperature-control Equipment of Laboratory-scale Fermentor Designed and Built at Forest Products Laboratory

Summary

Torula utilis yeast was grown on the wood sugars in wood hydrolyzates and in sulphite waste liquor. Yields were 32 to 53% of the sugar utilized.

About 94% of the total reducing material calculated as glucose in wood hydrolyzates and up to 79% in sulphite waste liquor could be utilized by yeast.

A light-colored yeast was obtained from both wood hydrolyzates and unevaporated sulphite waste liquor.

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New TAPPI Members

The Executive Committee of the Technical Association of the Pulp and Paper Industry has elected the following to membership:

Paul D. Applegate, Chief Chemist, Hercules Powder Co., Holyoke, Massachusetts, a 1939 graduate of Michigan State College.

Frank J. Ball, Research Chemist, West Virginia Pulp & Paper Co., Charleston, South Carolina, a 1941 graduate of the University of the South, with a Ph.D. degree from the University of Rochester in 1944.

Roger D. Ball, Engineer, Mead Corporation, Chillicothe, Ohio, a 1947 graduate of Ohio State University.

William C. Birdsey, Chief Engineer, Pioneer Div., The Flintkote Co., Los Angeles, California, a 1934 graduate of the California Institute of Technology.

J. William Burke, Chemical Engineer, Hercules Powder Co., Kalamazoo, Michigan, a 1937 graduate of the University of Michigan.

Wayne E. Case, Control Superintendent, Time, Inc., Kalamazoo, Michigan. Attended Western Michigan College.

William L. Failing, Assistant General Manager, Fir-Tex Insulating Board Co., St. Helens, Oregon, a 1934 graduate of Oregon State College.

Leonard R. Gwaltney, Quality Control Chemist, Ohio Boxboard Co., Rittman, Ohio, a 1931 graduate of the University of Akron.

Blanton W. Haskell, Engineer, Rayonier, Inc., Fernandina, Florida, a 1942 graduate of the Georgia School of Technology.

Glenn W. McKnight, Chief Inspector, Time, Inc., Kalamazoo, Michigan. Attended Western Michigan College.

James C. Mills, Sales, Wyandotte Chemicals Corp., Michigan Alkali Div., Wyandotte, Michigan, a 1931 graduate of Albion College.

Gilbert E. Paulson, Supervisor of Quality Control, Marathon Corporation, Ashland, Wisconsin. Attended Northland College.

Wendell R. Tobin, Research and Development Manager, American Box Board Co., Grand Rapids, Michigan, a 1933 graduate of Michigan State College.

Athey G. Gillaspie, Technical Director, The Hamilton Laboratories, Inc., Asheville, North Carolina, a 1933 graduate of Duke University with a Ph. D. degree.

Frederick C. Keeney, Student, The Institute of Paper Chemistry, Appleton, Wisconsin, a 1947 graduate of Texas Agricultural and Mechanical College.

David Y. Liversidge, Chemist, Eaton-Dikeman Co., Mt. Holly Springs, Pennsylvania, a 1940 graduate of Carnegie Institute of Technology.

Herman F. Mark, Professor of Organic Chemistry, and Director of the Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, New York, a 1921 graduate of Vienna College, Vienna, Austria, with a Ph. D. degree.

John R. Metz, Assistant Manager, Metz Paper Co., Pawtucket, Rhode Island, a 1947 graduate of North Carolina State College.

George O. Nelson, Technical Director, Coos Bay Pulp Corp., Empire, Oregon, a 1932 graduate of the University of Washington.

Kurt C. Neunfeldt, Mechancial Engineer, Hammermill Paper Co., Erie, Pennsylvania, a 1923 graduate of Technikum Altenburg, Germany.

Emil Ott, Director of Research, Hercules Powder Co., Wilmington, Delaware, a 1927 graduate of Swiss Institute of Technology, Ph. D. degree.

George W. Reynolds, Junior Engineer, Mead Corporation, Chillicothe, Ohio, a 1945 graduate of the University of Illinois.

Horace T. Scordas, Chemical Engineer, Union Bag & Paper Corp., Savannah, Georgia, a 1934 graduate of Georgia School of Technology.

Malcolm C. Stewart, Chemist, Puget Sound Pulp & Timber Co., Bellingham, Washington, a 1939 graduate of the University of Manitoba with an M. Sc. degree.

Hutton W. Theller, Senior Research Chemist, Crown Zellerbach Corp., Camas, Washington, a 1941 graduate of the University of California.

Alton P. Tracy, Chemist, John A. Manning Paper Co., Inc., Troy, New York, a 1926 graduate of Bates College.

Heinz Winzenried, Karton & Papierfabrik Deisswil A. G., Deisswill, Bern, Switzerland. Attended the Universities of Bern and Zurich. Dr. Winzenried is making practical studies in paper mills in the United States.

Norman F. Allemore, Tour Foreman, St. Joe Paper Co., Port St. Joe, Florida.

David R. Angus, Technical Adviser, Ford Motor Co., Dearborn, Michigan, a 1932 graduate of Columbia College.

John H. Batier, Technical Manager, Le Bewoid Francais, Begles, Gironde, France, a graduate of Ecole de Chimie, Bordeaux.

Bernard W. Burgess, Technical Assistant, Technical Section, Canadian Pulp and Paper Association, Montreal, P. Q., Canada, a 1946 graduate of Queen's University.

Charles H. Compton, Librarian, St. Louis Public Library, St. Louis, Missouri, a 1901 graduate of the University of Nebraska.

Kalamazoo Valley TAPPI Discusses Quality Control

Use of statistical quality control in the processes of paper making was urged on members of the Kalamazoo Valley Section of TAPPI at the Columbia Hotel on Thursday Nov. 6th. Ninety members of the section, with L. H. Mimms of the Kalamazoo Paper Company as presiding officer heard Dr. T. A. Pascoe, technical director of the Nekoosa-Edwards Paper Company describe the Shewhart method of quality control.

Dr. Pascoe stated that although there are differences between pulp and paper manufacture and the industries in which statistical quality control has been most used, control chart technique can be used in the control of many of this industry's processes. The main advantage gained through the use of these methods is guidance in when to make corrective action and when to leave a process alone. It permits, Dr. Pascoe demonstrated, a more accurate check of processes than customary averaging and give a larger allowance for normal deviations. It is possible for relatively inexperienced personnel to start using the simplest variations of these control methods and develop skill through actual use. There is a good possibility that the usual improvements in quality and control of the product will accrue during the apprentice period.

R. T. Trelfa and H. O. Ware of the Hercules Powder Company with A. C. Dreshfield, Consulting Engineer and the speaker, served as a panel for a forum on the subject after the talk.

Those present were:

A. Aiken, F. Hamilton, W. Kirkpatrick, C. Lilly, Allied Pa. Co.; W. P. Blamire, J. Hotop, G. Ritzema, W. R. Tobin, Am. Box Board Co.; C. Hoelderle, Anheuser-Busch Co.; N. N. Anning, The Bristol Co.; W. H. Weitzel, Calgon Co., Inc.; F. A. Root, Clinton Ind., Inc.; B. C. Johnson, L. L. Larsen, Detroit Sulphite & Paper Co.; M. H. Boyce, E. I. DuPont de Nemours; D. Melitzer, Garret-Burgess Co.; D. R. Erickson, K. Latimer, Graphic Arts Research Lab.; H. E. Nelson, French Paper Co.; W. C. Brian, R. R. Schaefer, A. Schratenbaer, Grand Rapids Fibre Card Co.; H. P. St. Clair, G. D. Gerpheide, Hawthorne Paper Co.; W. Alderman, Hart and Harrington Inc.; J. A. Stearin, J. W. Smith, R. Trelfa, H. O. Ware, Hercules Powder Co.; L. H. Mimms, Kalamazoo Paper Co.; A. Bernhardt, P. D. Carter, J. D. Chadderdon, W. G. Curry, G. F. Des Autels, W. F. Hathaway, W. L. Halnon, R. C. Germanson, R. G. Jones, M. W. Kane, L. H. La Liberte, L. O. Lake, F. Libby, H. Smith, of the Kalamazoo Vegetable Parchment Company; C. Beebe, S. Kukolich of the Lee Paper Co.; J. J. Harrison, Michigan Carton Co.; V. S. Burstein, J. A. Dean, Michigan Paper Co.; J. L. Waber, National Gypsum Co.; T. A. Pascoe, Nekoosa Edwards Paper Co.; J. H. Fritz, NOPCO Chem. Co.; A. C. Dreshfield, Consulting Engineer; D. W. McArthur, Reichhold Chemical Co.; A. W. Cole, H. Nendorf, Rex Paper Co.; M. P. Wingate, Rocky River Paper Co.; C. A. Harding, Schuler & Benninghofer; J. Paradise, St. Regis Paper Co.; E. B. Taylor, Stein Hall Mfg. Co.; A. Sherwood, M. Galbraith, D. D. Batchelder, C. T. Colgren, M. Dilver, Sutherland Paper Co.; C. Fletcher, W. Case, S. Foltz, D. C. Karoud, L. Orr, Time Incorporated.

Flameproofing Textile Fabrics

The Reinhold Publishing Company has recently issued "Flameproofing Textile Fabrics" by a staff of specialists, under the editorship of Major Robert W. Little, under QMC Research Project No. 27 of the National Research Council and the National Academy of Sciences. It is one of the ACS Monograph Series, No. 104 (410 pp. 6 x 9).

This book is a comprehensive survey of the subject and although textiles rather than paper products are referred to, the growing list of converted paper products makes the subject matter of interest.

In one chapter the nature of cellulose is reviewed briefly, followed by a thorough discussion of its degradation reactions at low and high temperatures. The influence of flame-retardent materials upon the formation of these products is proposed as one of the primary effects of fire-proofing.

The book includes many flameproofing treatments, an attempt being made to group the flameproofing agents according to the manner of their performance.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York 17, N. Y., at $6.75 per copy.

High Speed Mathematics

D. Van Nostrand Company has just issued "High Speed Mathematics" by Lester Meyers (555 pp. 5½ x 8½). This book has been prepared primarily to serve men engaged in business such as executives, salesmen, purchasing agents, engineers, bookkeepers and general office workers. Nothing more than a knowledge of simple arithmetic is required.

Speed and accuracy are acquired through the mastery of techniques rather than by trick methods. Once these techniques are learned their application is simple and swift. Among the practical applications described are discounts, preparing and checking bills, dealing with parts of the gross, interest, averages and proportions, profit ratios, and investments.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York 17, N. Y., at $5.95 per copy.

Colloid Science

The Chemical Publishing Company has recently issued "Colloid Science" by several authors. (208 pp. 5½x8¾). The text of this symposium was taken from a series of lectures given as a course in colloid science at Cambridge University in England, under the auspices of the Royal Institute of Chemistry. It deals with disperse systems and gives interpretations of phenomena encountered in surface films and interfaces.

Phase changes in monoplayers, multilayers, emulsion stability, adsorbed film at the solid-liquid interface, electrical double-layer, structure of micelles, electrophoresis, fat metabolism, membrane equilib, rium, identification of bonds and structural units by infra-red spectra are among the important topics discussed in this volume.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York, N. Y. at $6.00 per copy.